...NOLOGY DEPARTMENT

ROADS AND STREETS

...E, 1948 HIGHWAYS BRIDGES AIRFIELDS HEAVY CONSTRUCTION

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DETROIT

IT TAKES ALL FIVE TO PRODUCE TIMKEN® ROCK BIT PERFORMANCE

1. It takes Timken rock bit design with the original one-piece solid shoulder construction.
2. It takes Timken Steel developed in our own metallurgical laboratories and made in our own modern steel plant.
3. It takes factories exclusively devoted to rock bit production, plus years of specialized manufacturing experience and "know how".
4. It takes a system of scientific quality control that leaves nothing to chance.
5. It takes a practical knowledge of rock formations in order to select the correct types of bits required for best results.

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THE TIMKEN ROLLER BEARING COMPANY - ROCK BIT DIVISION, CANTON 6, OHIO - Cable Address "TIMROSCO"

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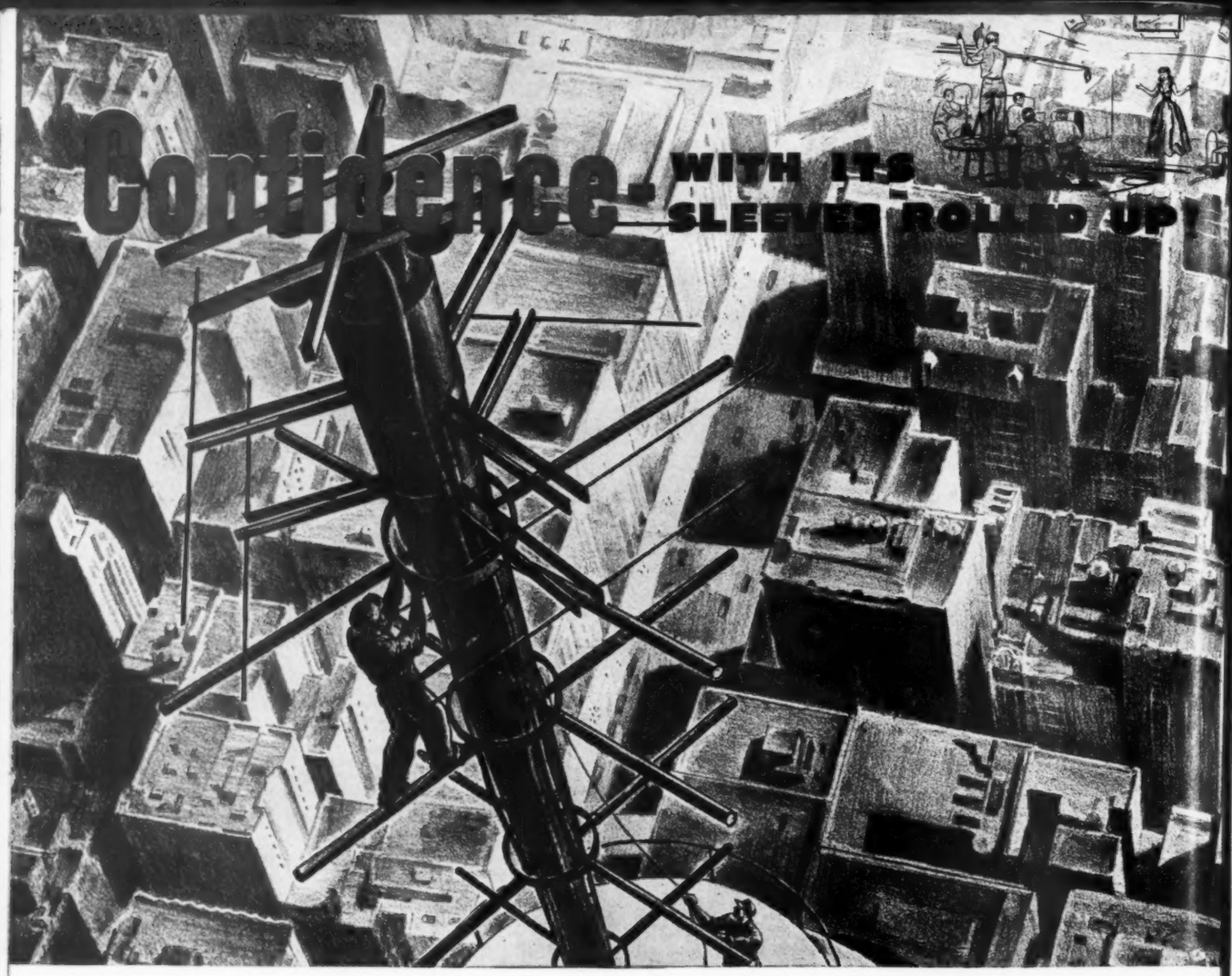
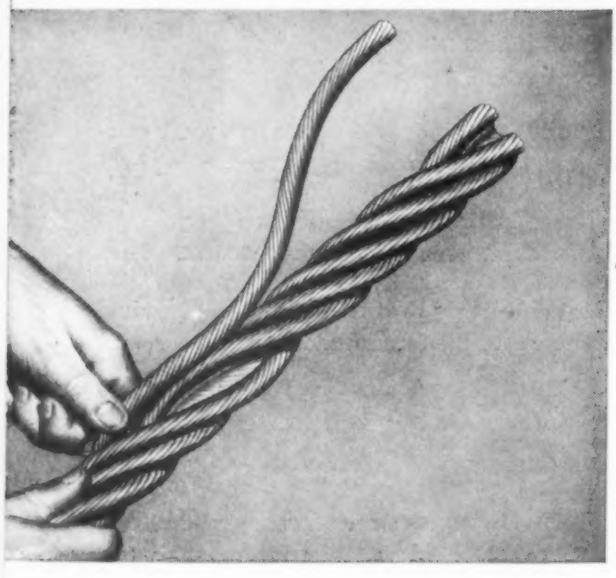
TRADE-MARK REG. U. S. PAT. OFF.
ROCK BITS





ATOP THE WORLD'S TALLEST BUILDING . . . yet not high enough! Television's need for unobstructed, long-range broadcasts may be met by planes in the stratosphere, relaying signals from the earth. Engineers working on this problem are confident of ultimate success.

With like confidence, Roebling blazes new trails in developing and making products vital to communication and all other industries. And the widespread confidence reposed in Roebling is our most guarded asset. Leadership is maintained only by constant progress . . . our ideal is to make Roebling products and engineering service the best obtainable anywhere, *any* time.

WHEN TO SPECIFY ROEBLING *Preformed* WIRE ROPE

WHEN IT WILL SAVE YOU MONEY is the time to specify Roebling Preformed Wire Rope. Wherever wire rope is subjected to severe bending, Roebling Preformed is an outstanding money-saver. On thousands of installations it lasts far longer than Non-Preformed ropes . . . pulls down performance costs to an all-time low.

Great resistance to fatigue from bending helps give Roebling Preformed a long life, but you can chalk up other big advantages. Preformed is not inclined to twist and kink . . . is easy to handle and install. It can be cut without seizing. Broken wires lie flat . . . don't injure hands or chew up drums and sheaves.

Get your Roebling Field Man's advice about Preformed and the possibility of it saving you money. You can act on his suggestions with full confidence for he *knows* wire rope, how to choose the ***right*** one, how to maintain it for top service. Write or call him at your nearest Roebling branch office.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

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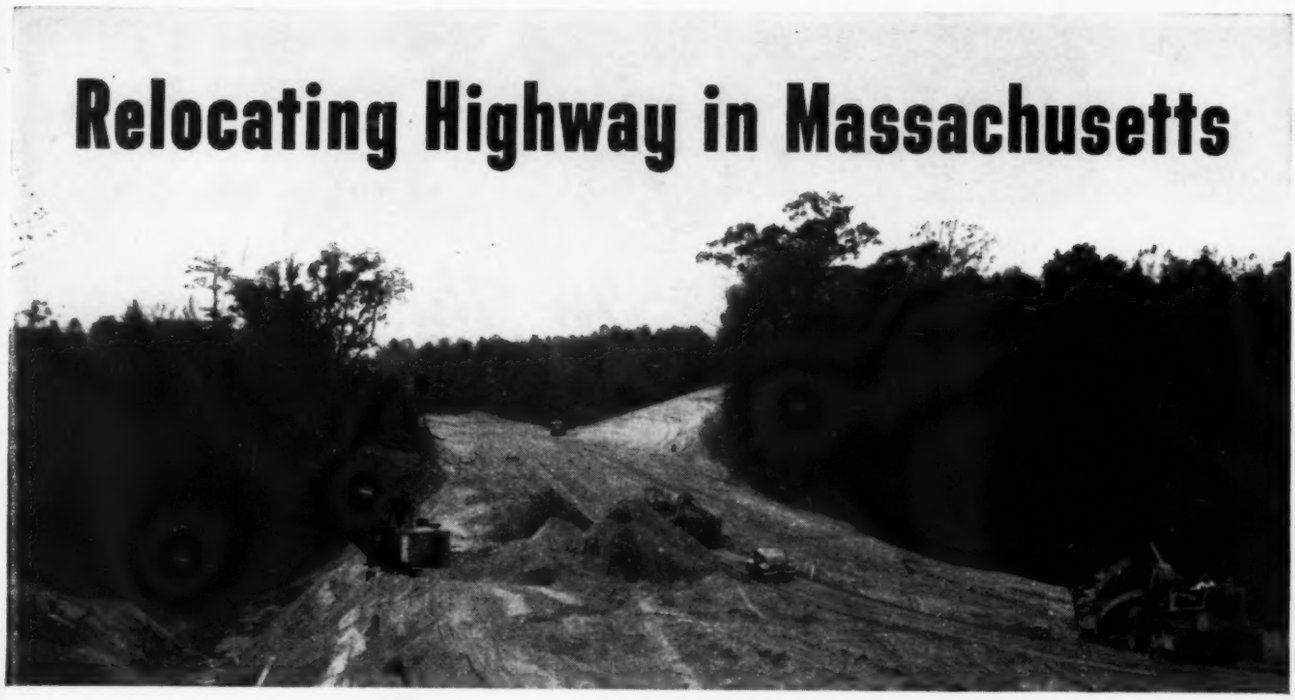
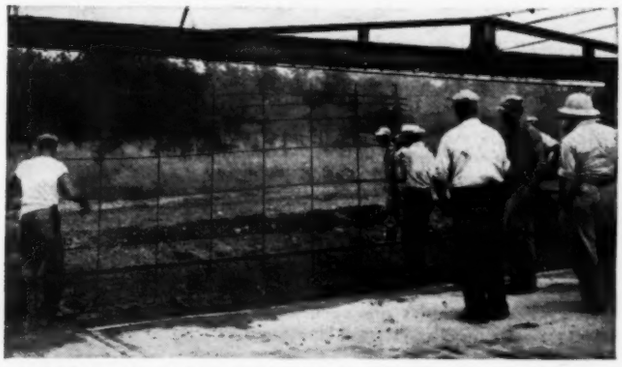
Relocating Highway in Massachusetts



Earth-moving equipment on the job as road is pushed through heavily wooded, high level area.

William G. Johnson, resident engineer, Massachusetts Department of Public Works (seated), discusses project with William Sauer, general superintendent.



Bethlehem Hinged Bar Mat handled by only two men. With bottom section placed, hinged portion needs but slight push to fall into position.

Workers tamp excess concrete about Bethlehem Hinged Bar Mat as skip prepares new batch. Note bar mat lies flat.

Water truck parks on newly-paved first lane as skip prepares course for second strip.

Flood waters from the Connecticut River have long plagued Route 116, north-south highway connecting Chicopee and South Hadley, Mass. To avoid this condition, the Massachusetts Department of Public Works has moved part of Route 116 to high ground a considerable distance to the east. The road is now called the High Level Route.

These pictures show construction of the new two- and four-lane, 19,000-ft highway by Daniel O'Connell's Sons, Inc., Holyoke, Mass. Bar mats, dowel units, guard rail posts and bridge reinforcing were supplied by Bethlehem.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

STEEL FOR HIGHWAYS

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Guard Rail Posts • Wire Rope and Strand
Hollow Drill Steel • Spikes • Timber Bridge Hardware
Tie-Rods • Pipe • Bolts and Nuts
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BETHLEHEM STEEL

ROADS AND STREETS

JUNE, 1948 • VOL. 91 • No. 6

With Roads and Streets Have Been Combined Good Roads Magazine And Engineering & Contracting

Coming Articles

Next Month the Road Show Issue!

In July R&S you'll find virtually a complete Road Show in print—a special section devoted to describing the equipment, materials and exhibits to be seen at the Show in Chicago, and where to find individual booths.

Articles for YOU in Every Issue

Feature articles in July and succeeding issues will include, to mention a few items:

"Highways are Tailor-made in Kansas", by W. J. Arndt, Assistant Engineer of Materials, Kansas state highway commission.

"The Portable Aggregate Plant", by Vic Brown—a summary of the types of equipment units found in such plants today and the importance of modern mobile equipment in roadbuilding.

"How Are We Doin' on Expressways?" Beginning a series of reports telling how well—or poorly—various cities are coming along with their expressway programs. Houston will be presented first.

Snow and Ice Control—methods and experiences in Detroit, Minneapolis, Lansing, other cities.

ALSO: "Safe Drinking Water on Construction" . . . "Hot-Mix Hauled 45 Miles" . . . "Preheating for Welding" . . . "How Two Local Materials Were Combined for Road-mix Job" . . . "Road Condition as Accident Factor" . . . "New Devices That Aid Paving Work" . . . "Moving 50,000 Cu. Yd. Daily in a Swirl of Desert Dust" . . . "What Size Should the Individual Contract Be?" . . . "Making Better Use of Your Streets" . . . and more to come.

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

Gillette Publishing Company
Publication and Editorial Offices,
22 West Maple Street, Chicago 10, Ill.

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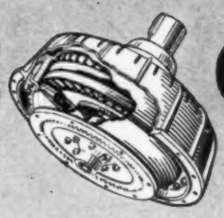
THE "820" IS ALWAYS *ready for rock*... BECAUSE THE HYDRAULIC CLUTCH



Absorbs Shock

The inevitable and unavoidable shocks and impacts, resulting from heavy-duty digging never faze the Lorain-820 because its Hydraulic Clutch absorbs and cushions the costly strains and stresses on the mechanism and cables.

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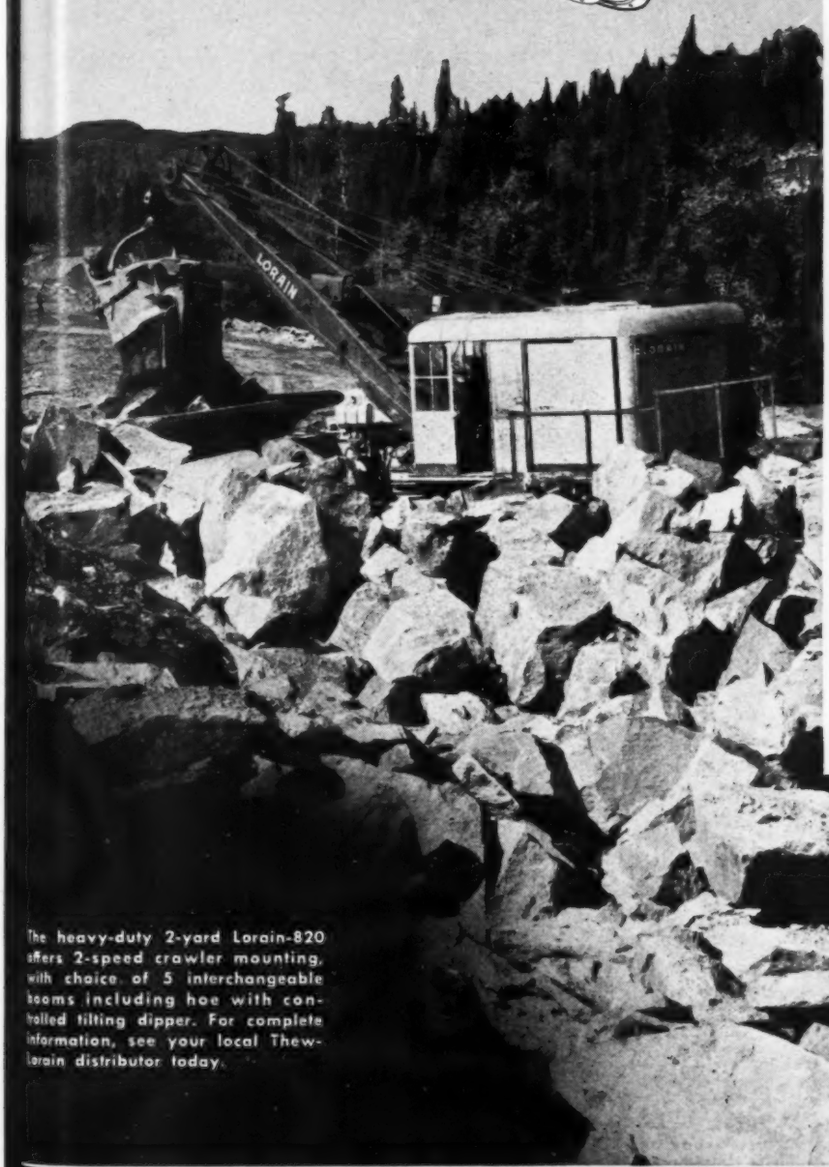
The Lorain-820 is a smooth operator because the Hydraulic Clutch eliminates shake and shock.

Improves "Hang On"

You can "slug it out" with rock knowing that the Lorain-820's greater digging power won't fade or fizzle but will "hang on" until the most unyielding rock is in the dipper.

Prevents Stalling

You can't stall the engine under any digging circumstances.



The heavy-duty 2-yard Lorain-820 offers 2-speed crawler mounting, with choice of 5 interchangeable booms including hoe with controlled tilting dipper. For complete information, see your local Thew-Lorain distributor today.

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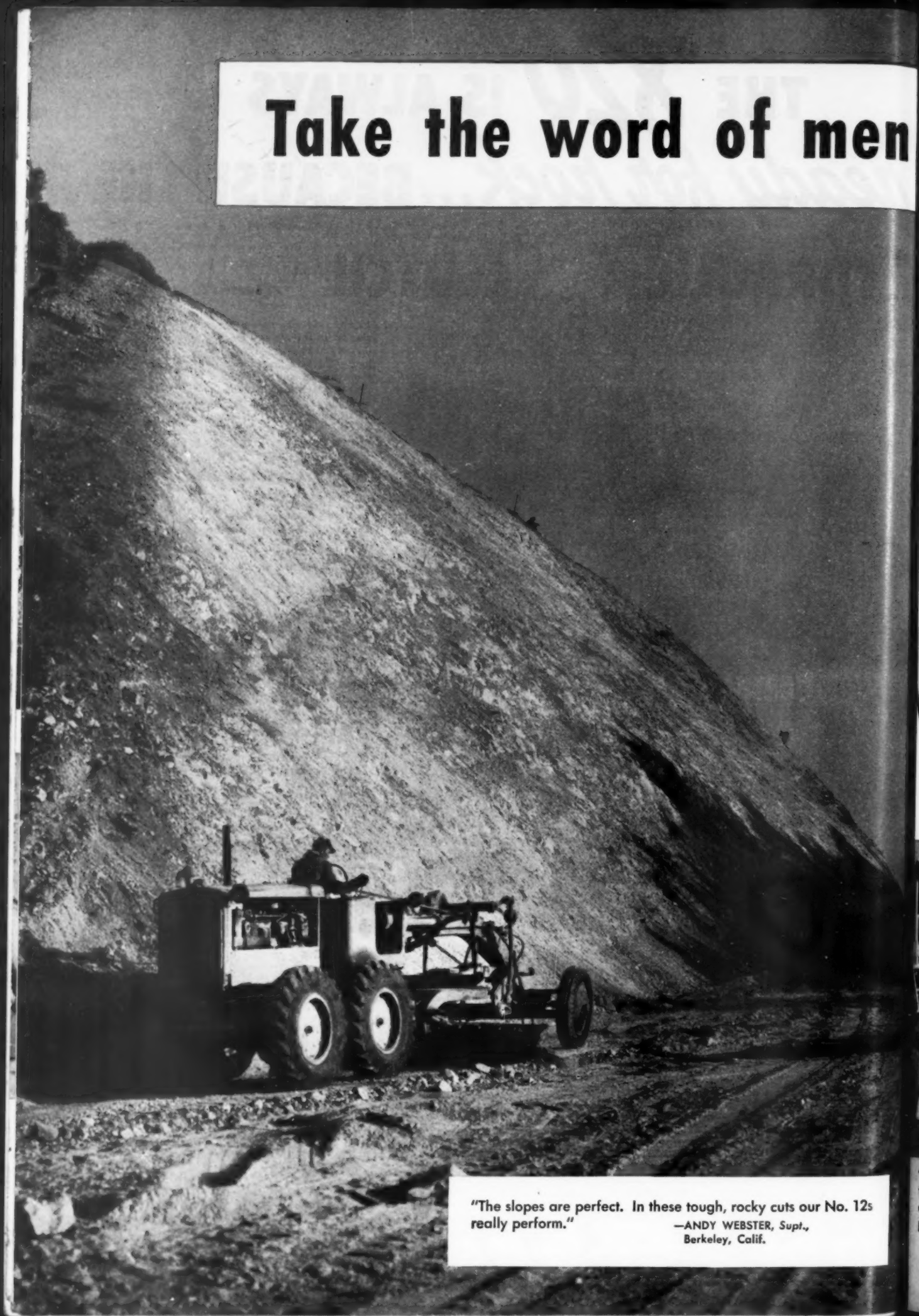
Thew **Lorain** ® **820**

Take the word of men



"The slopes are perfect. In these tough, rocky cuts our No. 12s really perform."

—ANDY WEBSTER, *Supt.*,
Berkeley, Calif.

en who know...

Who profits when "Caterpillar" Diesel Motor Graders are used for highway construction and maintenance?

The answer is everybody. Owners, superintendents, operators, engineers and taxpayers all win. They get better work, done faster, at lower cost.

Here are some straight-from-the-shoulder comments by men who know what they're talking about and mean what they say.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

Don't miss the "Caterpillar" exhibits at the ARBA National Road Show. Soldier Field, Chicago, July 16 to 24.

CATERPILLAR DIESEL

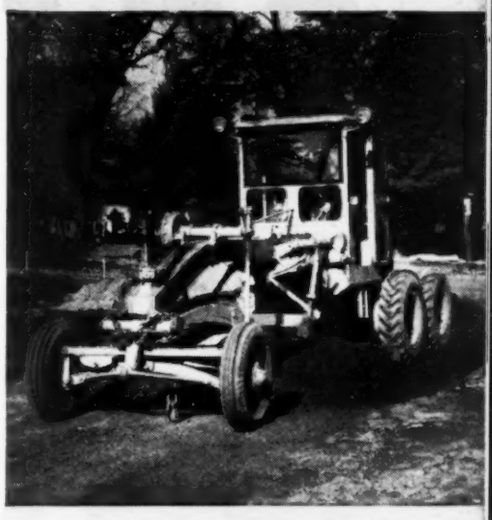
REG. U. S. PAT. OFF.

WHEN YOU THINK OF GOOD ROADS, THINK OF THE BIG YELLOW MACHINES THAT BUILD THEM

ENGINES
TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

"The No. 12 is the best grader we've ever seen. It'll take all we can give it."

—NORMAN BROWN, *Owner*, Rio Vista, Calif.



"It can't be beat. Plenty of power. Can do the work of a bulldozer. I've even cut down trees with it."

—ALBERT J. MARCHAND, *Operator*, South Hadley, Mass.

"Having used 'Caterpillar' equipment for 20 years, I know its economy and durability. We appreciate the added power of the new models."

—JASPER E. MYLES, *County Engineer*, Kearny County, Kansas

"This machine has more power, more front axle clearance, easier operation from controls."

—KEN SMITH, *Foreman*, Scotts Bluff County, Nebr.

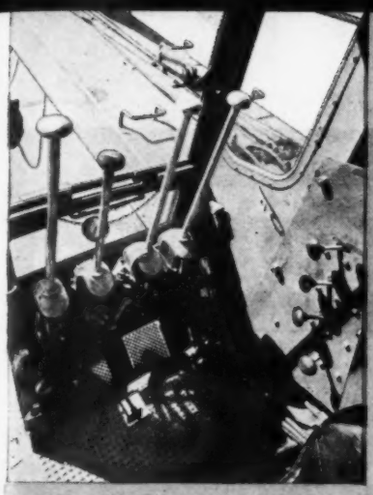
"Fine traction with large tires. It has power to handle these hills easily, and traction to handle the mud."

—HOWARD H. WHITE, *Operator*, Athol, Mass.

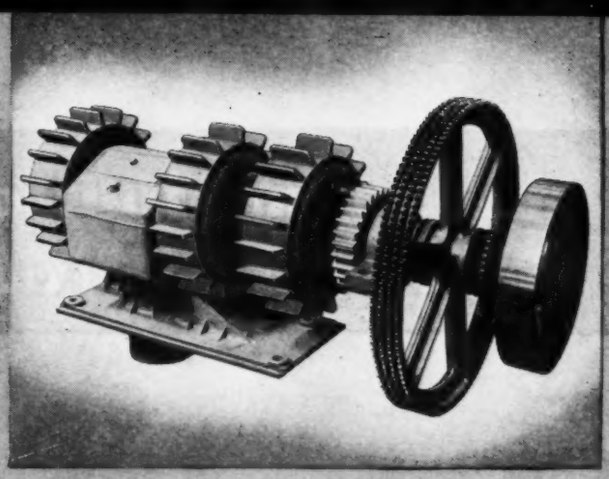
IN THE MONTHS AHEAD YOU'LL NEED A FAST, POWERFUL, DEPENDABLE, ECONOMICAL MACHINE

like this...

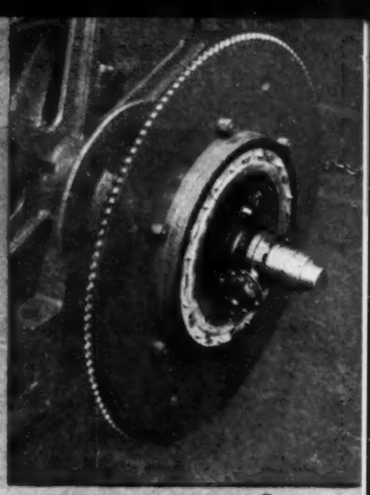
MARION 33-M



AIR CONTROL—all motions controlled by air. Simple—easy to operate—powerful.



SWING SHAFT—This swing, propel and crowd retract shaft assembly is equipped with three Fawick Airflex clutches which require no adjustment at any time. Special heat dissipating fins assure cool running clutches.



INDEPENDENT BOOM HOIST, standard on all machines, for high speed operation and safe lowering of boom.

THE BIGGEST LITTLE MACHINE ON CRAWLERS . . .

Fast . . . powerful . . . a big yardage producer . . . describes the MARION 33-M shovel.

SIMPLICITY OF DESIGN—clean and compact throughout.

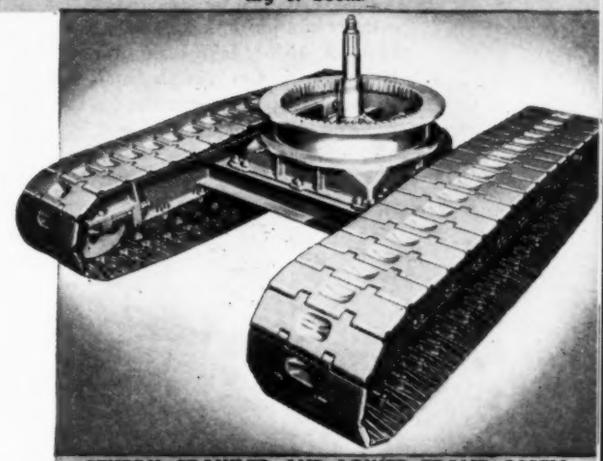
STURDY CONSTRUCTION—built for maximum strength, long life service and low maintenance.

EASE OF CONTROL—all motions, steering, propelling, braking, swing brake, dipper trip, and gear changes are AIR CONTROLLED.

EASE OF MAINTENANCE—brake adjustments, all machinery, and lubricating fittings are readily accessible. Only one adjustment for hoist and crowd out clutches. No adjustments needed for swing, propel, crowd retract or boom hoist clutches.

READILY CONVERTIBLE—from one front end to another.

These and many more desirable features make the MARION 33-M a fast, powerful, dependable and economical machine.



STURDY CRAWLER AND LOWER FRAME ASSEMBLY—self-cleaning, non-clogging crawlers assure free operation under difficult ground conditions.

COMPACT, ACCESSIBLE MACHINERY easy to get at for daily routine attention. Mounted on sturdy cast-welded main frame.

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type "X" diagonal screed finisher

—the revolutionary labor-saving tool to work with today's mass production pavers. Can finish flush to higher form; saves carry-back; insures precision-smooth surface.

see them all at the Road Show next month or see your Jaeger distributor today

Air Compressors
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Concrete Screw Spreaders
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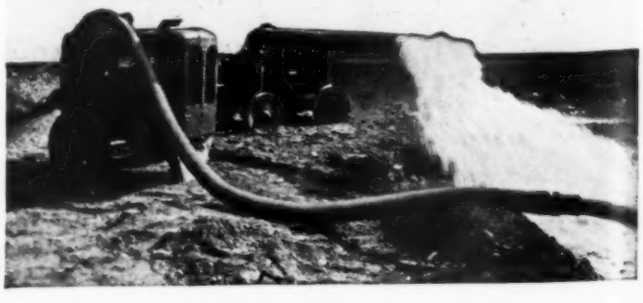
"air plus" compressors

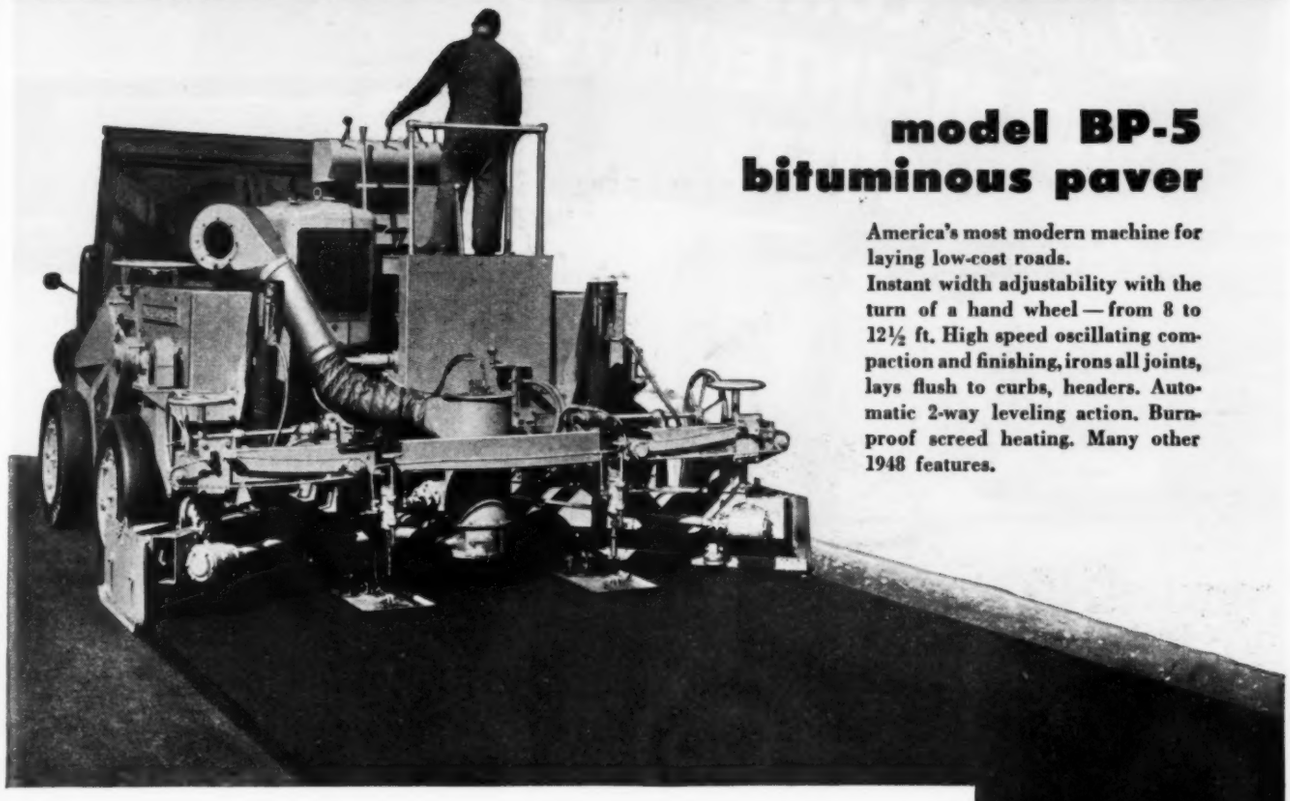
Portable and stationary; sizes up to 600 ft. Designed for full-pressure operation of modern air tools. See them before you buy any compressor.

"sure prime" pumps

Drainage pumps for all requirements up to 10" size, plus latest line of pressure pumps for higher head service such as tank trucks, roadside seeding and weed control spraying, water supply, etc.



and paving machines for labor-saving mass production



model BP-5 bituminous paver

America's most modern machine for laying low-cost roads.
Instant width adjustability with the turn of a hand wheel — from 8 to 12½ ft. High speed oscillating compaction and finishing, irons all joints, lays flush to curbs, headers. Automatic 2-way leveling action. Burn-proof screed heating. Many other 1948 features.

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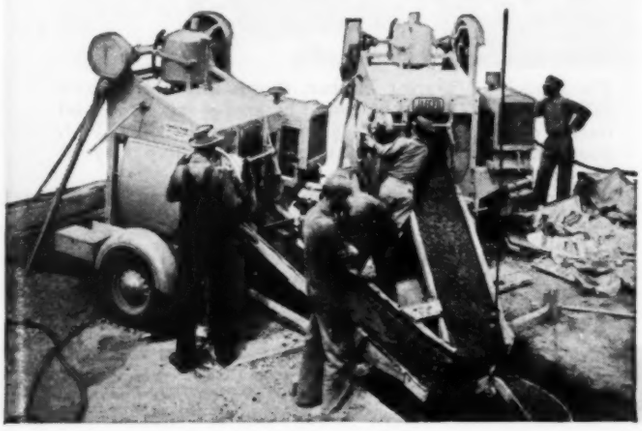
"speedline" mixers

Recognized world's leading line of portable mixers for high daily yardages of concrete, bituminous cold patch, plaster, mortar. Sizes 3½S to 16S.



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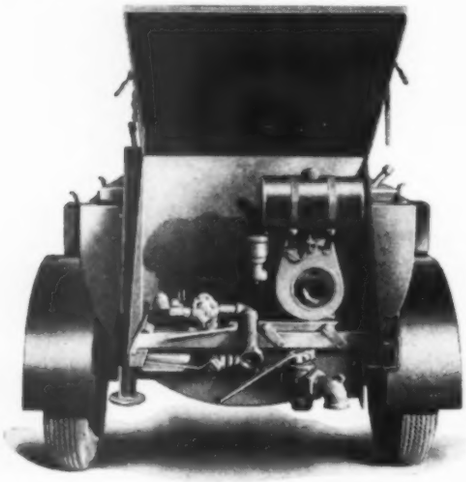
Standard Steel Works Model 7 Street Flusher, shown above, is fully streamlined. Constructed of hi-tensile steel throughout, thus reducing corrosion four to six times, 15% to 20% saved on dead weight, tensile strength is increased 20% per square inch. Available in 1100, 1500 and 2000 gallon sizes.

The Model SJ equipped with a 100 G.P.M. Pump, powered by a 7.2 h.p. engine, will handle any type of material through spray bar lengths up to 10 feet. Two powerful burners pour heat through 5 inch heat flues—assures fast heating. Single lever controls all operations—spraying shoulders, relocating curves, hand spray, seal coating, patching chuck holes, or crack filling.

The pull type construction and maintenance engine driven broom (also available in traction driven), shown below, reduces cleaning costs. Broom suspended so that it is pulled into the road bed rather than pushed. Results in longer broom wear—lower replacement costs.

Model 957 Pressure Distributor shown above will handle all types of primary black top construction. Equipped with 350 G.P.M. Pump, 27 h.p. engine and completely full circulating spray bar.



For faster patching, the Model "S" Tar Kettle shown above is equipped with motor driven 10 G.P.M. pumping. Model S Kettle is available in 80, 110, 165, 200 and 350 gallon sizes. One man can operate—reduce labor costs.

The Model TF Tractor Flusher, shown above, is a 1000 gallon capacity. It can be towed by any 14 h.p. industrial tractor or larger. The TF is equipped with 250 G.P.M. pump and 15 h.p. air-cooled engine or pump may be driven by tractor power take off.

OTHER PRODUCTS:
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Use GALION TANDEM ROLLERS

Galion Tandem Rollers are available in four sizes—3, 5, 8, and 10 tons, with weights variable from 3 to 14 tons.

Write for Catalogs No. 296-A and 305

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FEATURES

- Simple operating controls . . .
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- Powerful quick-starting engine--gasoline or Diesel . . .

GALION Estab. 1907

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TOURNADOZERS

300 h.p. PUSHER loads up to 30 yards in less than 1 minute

WITH TODAY'S biggest team of dirtmovers, the B Tournadozer and B Tournapull, you have, for the first time, a perfect combination of BIG matched high-speed dirtmoving equipment. The new B pusher behind the B Tournapull gets big loads fast — up to 30 heaped yards in less than a minute. This dozer has speed and maneuverability to synchronize its full 300 h.p. instantly with the 240 h.p. on the Tournapull . . . it's this matched equipment that gives you accurate pushing and cutting control. Both Tournapull and Tournadozer have instantaneous gear selection without shifting . . . both have instantaneous electric controls. Both units drive on big (24.00 x 29) tires built with the new tapered beads and rayon cords to take safely, the tremendous traction developed . . . tremendous loads carried. These new type tires permit low pressure flotation for work in sand and muck. They're interchangeable — from Tournadozer to Tournapull.

You will see this B combination on a lot of the big dirtmoving projects of 1948. It follows the LeTourneau tradition — always seeking to give you better tools for increased production and lowest cost. With this new B Tournapull and B Tournadozer team we can give you a NEW and more profitable "lowest net cost per yard."

See your LeTourneau Distributor now. Ask him to show you how these "B for BIG" LeTourneau dirtmovers can improve YOUR profit possibilitiies for 1948.

Specifications

	B TOURNADOZER	B TOURNAPULL
Engine	300 hp Diesel	240 hp Diesel
Speeds		
1st gear	Fwd. and Rev. 1.6	Fwd. and Rev. 2.00
2nd gear	Fwd. and Rev. 3.3	Fwd. and Rev. 4.00
3rd gear	Fwd. and Rev. 6.8	Forward 8.00
4th gear	Fwd. and Rev. 13.6	Forward 16.00
Tires	24.00 x 29	24.00 x 29
Control	Tournatorque electric	Tournatorque electric
Transmission	Constant Mesh-Tournamatic	Constant Mesh-Tournamatic
Drive	4-wheel	2-wheel
Working Weight	25 tons	22 tons empty
Load Capacity	Blade: 5½ cu. yds. top soil	Scraper: 30 yards (35-ton load limit)

R. G. LeTOURNEAU, Inc.
Peoria Illinois

Tournapull — Trademark Reg. U.S. Pat. Off. GBP
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S TOURNAPULLS

LEADING THE POWER PARADE

AT this greatest of all *road shows* you'll see International leading the power parade in the earthmoving and roadbuilding industry!

Everything in the International Industrial Power line will be shown... everything from giant TD-24 crawlers with matched equipment down to the Industrial CUB with side-mounted mower. You don't have to go outside the International Industrial Power exhibit to see all the modern roadbuilding and earthmoving equipment you need!

International Harvester's part of the Road Show at Soldier Field in Chicago will be a show in itself! It will occupy 80,000 square feet of space and spill over into an additional 90,000 square feet occupied by International's allied equipment manufacturers. Here International will show you the power and equipment that will do your jobs most economically and fast.

And your International Industrial Power Distributor is ready to supply your needs in power, equipment, accessories and service.

Industrial Power Division

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue Chicago 1, Illinois

CRAWLER TRACTORS
POWER UNITS
DIESEL ENGINES
WHEEL TRACTORS

INTERNATIONAL

AT THE A.R.B.A. ROAD SHOW

45th Annual Convention and Road Show
SOLDIER FIELD
CHICAGO
16-24, 1948

Industrial Power

INTERNATIONAL HARVESTER

You get drainage at its best when ARMCO End Sections are teamed with ARMCO Metal Culverts.

On the upstream end these one-piece metal units "funnel" the flow into your PIPE-ARCH or round pipe. Entrance loss is reduced to a minimum. Downstream, the flared design cuts discharge velocity and lessens the danger of undermining.

ARMCO End Sections meet all the requirements for modern culvert end treatment. They blend perfectly with any landscape plan. There are no obstructions above the shoulder grade—an important safety feature—and nothing to interfere with regular maintenance operations such as mowing and snow removal.

Installing these ARMCO End Sections is an easy matter for a small unskilled crew. Little excavation is required and there are no curing or follow-up operations.

Tightly banded to the culvert pipe, ARMCO End Sections resist transverse pressures, settlement and frost action. If conditions change, they can easily be salvaged for use at another location. Write for complete data. Armco Drainage & Metal Products, Inc., 363 Curtis Street, Middletown, Ohio.

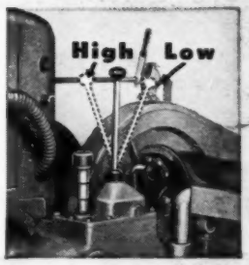
Export: The Armco International Corporation.

ARMCO

ARMCO END SECTIONS

2 SPEEDS

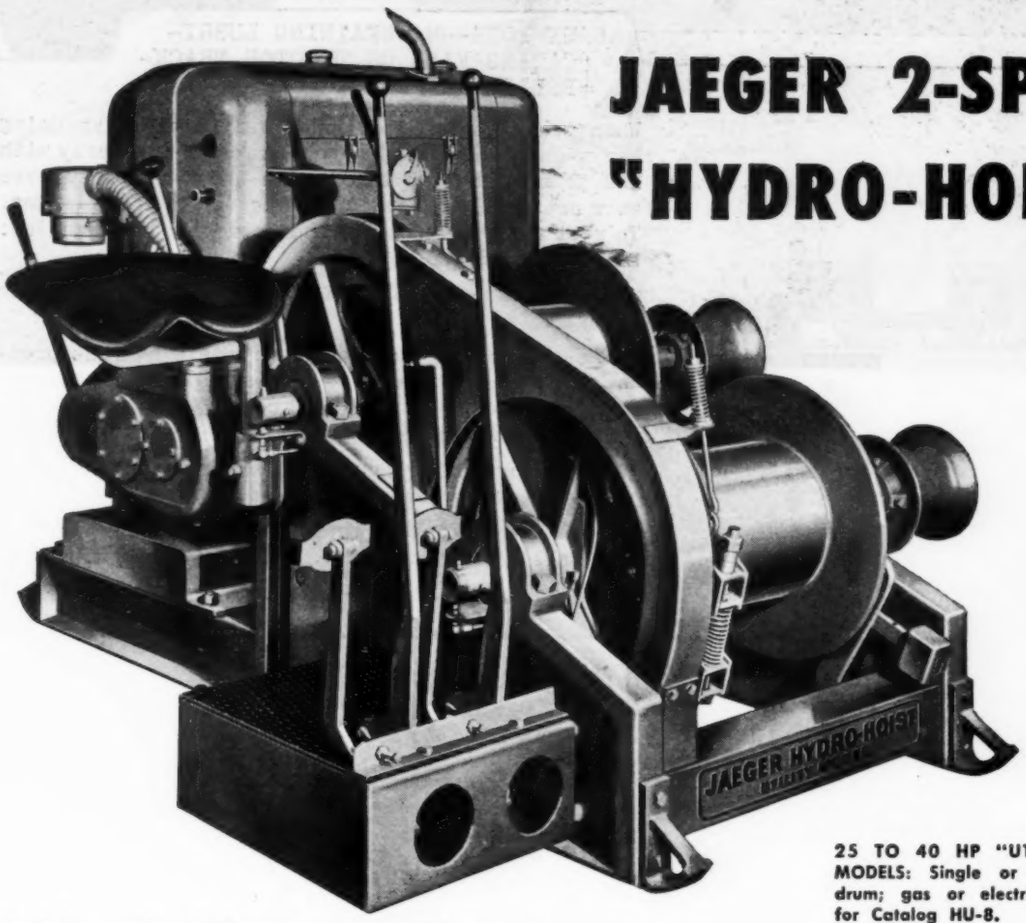
Just shift a lever to "Low Gear" for power, "High Gear" for speed with lighter loads.



HYDRAULIC FINGER-TIP CONTROL

for faster, easier, more accurate operation — just like $25,000 cranes.

JAEGER 2-SPEED "HYDRO-HOIST"

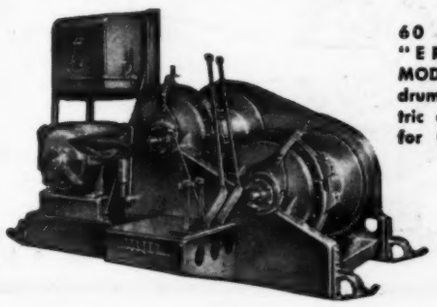


25 TO 40 HP "UTILITY" MODELS: Single or double drum; gas or electric. Ask for Catalog HU-8.

It's labor-saving for your operator; it's money-making for you! With Jaeger hydraulic controls at his finger-tips the hoist operator "feels" his load perfectly but never has to fight its weight. He handles the work faster, places it more accurately—sets your whole job a quicker pace.

2-Speed Automotive Transmission has a double advantage—(1) gives you the flexibility of low and high gear performance; (2) permits quick interchangeability of power from gas or diesel engine to squirrel cage electric motor, all at standard 1800 rpm.

All-steel construction (no more broken side frames or drum flanges), instant releasing hydraulic clutches with single outside adjustment, air-cooled hydraulic brakes, many other advanced features. See your Jaeger distributor, or ask for Catalog.



60 TO 100 HP "ERECTORS" MODELS: Up to 3 drums; gas, electric or diesel. Ask for Catalog HE-8.

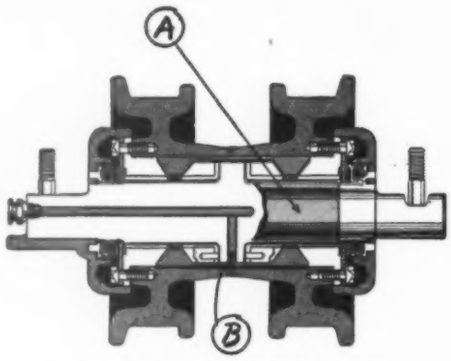
THE JAEGER MACHINE CO.,

COLUMBUS 16, OHIO

regional offices: 1504 Widener Bldg. Philadelphia 7 · 226 N. La Salle St. Chicago 1 · 235 American Life Bldg. Birmingham 1

PUMPS • AIR COMPRESSORS • TOWERS
PAVING MACHINES • MIXERS • TRUCK MIXERS

CASE 1024--MAINTAINING LUBRICATING FILM ON TRACTOR TRACK-ROLLER BEARINGS.



CATERPILLAR TRACK ROLLER BEARING

When track-roller bearings in a Caterpillar doing heavy-duty dirt moving were lubricated regularly with RPM Tractor Roller Lubricant, their service lives were noticeably extended. Efficient in all climates. To meet various conditions, it comes in three grades: Light, Medium and Heavy.

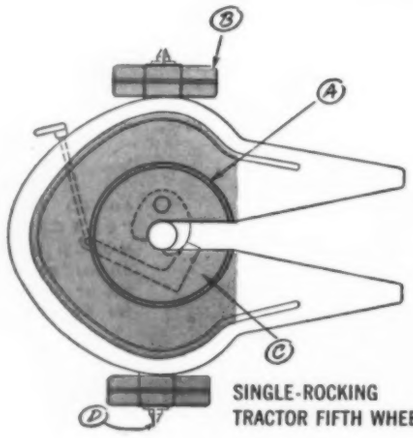
A. Contains a highly effective chemical anti-wear agent.

B. Has new stringiness agent--resists extreme pressure and constantly changing shock loads, controls flow of lubricant through bearings and keeps film on bearing surfaces.

RPM Tractor Roller Lubricant is resistant to water and helps seals keep out grit and dust.

A special kind of this outstanding product, RPM Tractor Roller Lubricant A.C. Type is made for Allis-Chalmers tractors.

CASE 1028--MAINTAINING LUBRICATING FILM ON CHASSIS BEARINGS UNDER EXTREME PRESSURES.



SINGLE-ROCKING TRACTOR FIFTH WHEEL

In the severest truck and bus service RPM Chassis Grease TB stayed on bearings longer than usual period between grease jobs. Improved product made specially for heavy-duty service. Has distinctive gray color. Comes in three grades: Light, Medium, Heavy.

A. Contains metallic anti-wear ingredient - resists wear and prolongs bearing life.

B. Cushions bearings against shock loads ... improved stringiness additive keeps film on surfaces - provides high adhesion and cohesion properties.

C. Heavy oil stock assures tough lubricant film - minimizes galling on large bearing surfaces.

D. Has excellent pumpability in cold weather - Light grade pumps freely in temperatures down to minus 10°F.

RPM Chassis Grease TB is waterproofed, keeps protective collar at outside edge of shackle bearings.

For additional information and the name of your nearest Distributor, write

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225 Bush Street, San Francisco 20, California

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HOW TO MAKE YOUR BUDGET DOLLAR GO FARTHER

HUBER 3-WHEEL ROLLERS
Automotive type, built in sizes from 5 to 12 tons. A fast, economical and powerful machine.

HUBER MAINTAINER
A versatile machine that also serves as a bulldozer, lift-loader, patch roller, snow-plow, or rotary broom.

HUBER TANDEM ROLLERS
Variable weight offering maximum maneuverability. Built in sizes from 3 to 12 tons.

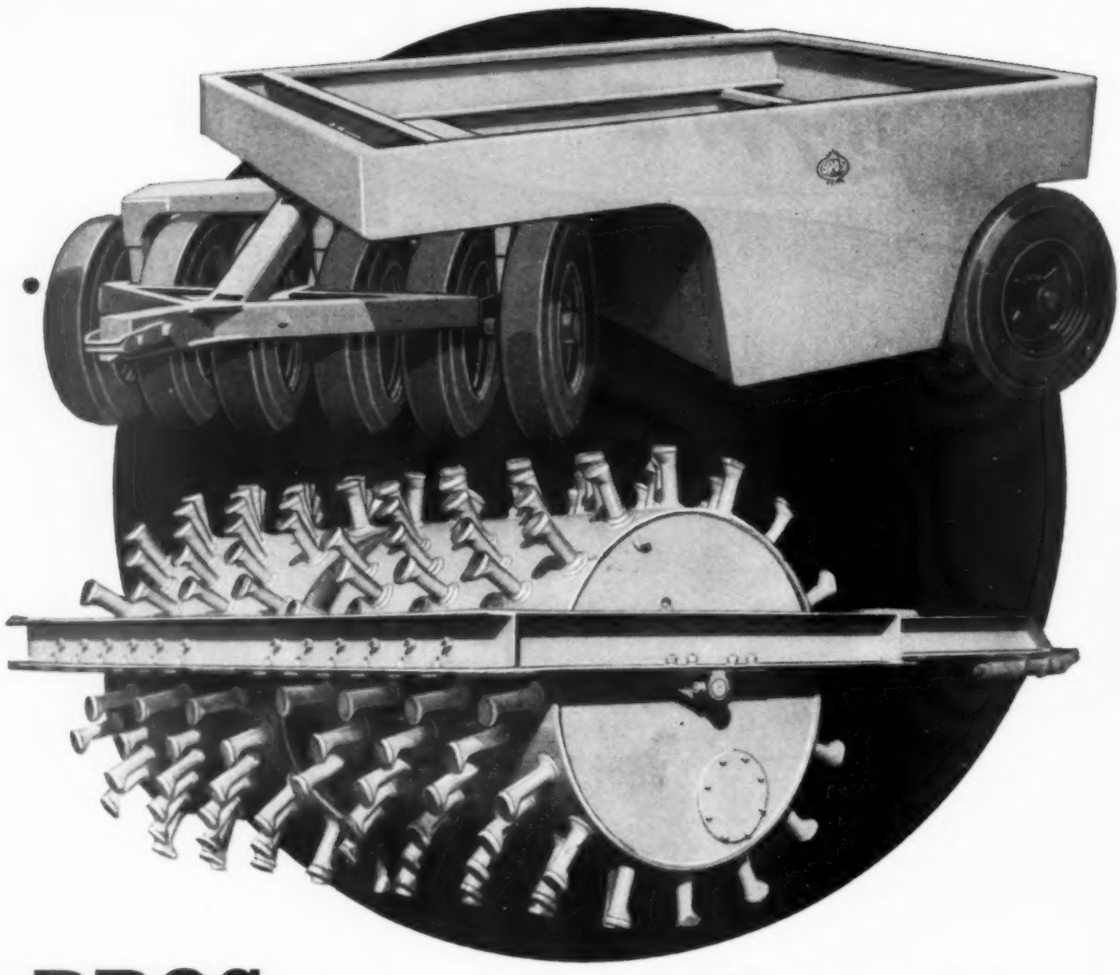
The answer is simple. All you need is Huber Road Machinery with its reputation for speedy operation . . . plenty of power and stamina . . . maximum time and money saving economy . . . dependable performance . . . long life service. Drop in and see your nearest Huber distributor. Let him show you why Huber Road Machinery should be working for you. Let him tell you about the many important features built into these fast machines. If you would, your next road machinery will be Huber.

SEND FOR BULLETINS
describing the Huber Road Machinery in which you are particularly interested. Write us today!

THE HUBER MFG. COMPANY • MARION, OHIO, U. S. A.

HUBER
3 Wheel • Tandem ROAD ROLLERS and MAINTAINERS

MEETING THE NEEDS FOR BETTER COMPACTION



BROS Pneumatic Tire Rollers and Tampers

• Every type of compaction work calls for different specifications of soils and densities. But always the job calls for correct and complete compaction . . . thorough stabilization free of voids and soft spots.

To do these jobs quickly and at low cost, *Bros* offers a compacting tool designed for specific soils and densities.

The *Bros* line includes the famed *Bros* Pneumatic Tire Rollers in oscillating Straight Wheel and oscillating Wobble Wheel types* . . . and *Bros* Tamping Rollers from the single sheep foot roller to the new *Bros* Giant Tamper which delivers a pressure of 800 pounds per square inch, meeting the requirements of earth dams, airport-runways and super-highways.

Write today for informative booklets discussing modern compaction and the application of *Bros* rollers in meeting modern requirements with economy. Bros Boiler & Manufacturing Co., Minneapolis 14, Minn.

**Only Bros makes both oscillating Straight Wheel and oscillating Wobble Wheel Rollers. Patent Nos. 20241824, 2241098, U.S.A. 400228, Canadian.*

BROS

WM. BROS BOILER AND MANUFACTURING COMPANY • MINNEAPOLIS 14, MINNESOTA

See us at the Road Show—Booth 3009

LeTOURNEAU USES...

Velvetouch

All-Metal Clutch Facings and Brake Linings

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Model C Tournadozer

Power control unit brake band lining.

Steering brake disc.

Steering and transmission clutch disc.

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Fast, highly maneuverable, and extremely powerful . . . LeTourneau relies on Genuine Velvetouch all-metal clutch facings and brake linings for accurate, economical power control. Because the scientific mixture of powdered metals, used in making Velvetouch, minimizes chattering and slipping . . . insures smooth, positive operation. You'll find Genuine Velvetouch lasts longer, too . . . for being all-metal, it won't rot in oil or "burn" like conventional friction material. *Send for details today.*

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FOR BRAKE AND CLUTCH USE **Velvetouch**

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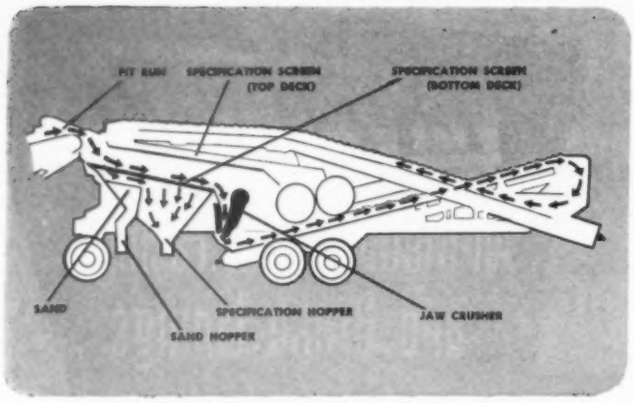
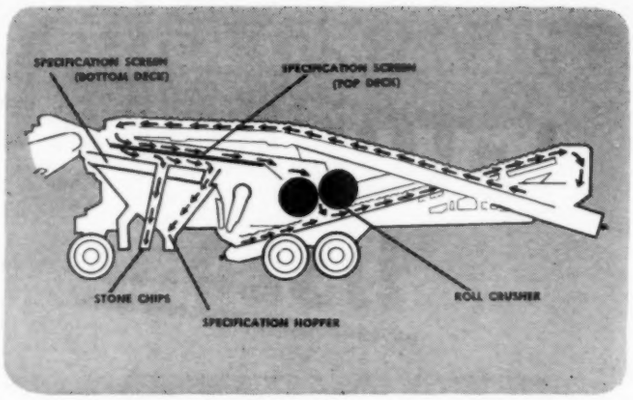
WORLD'S LARGEST MANUFACTURERS OF ALL-METAL CLUTCH FACINGS AND BRAKE LININGS



1 **PIT RUN** is fed to bottom deck of 3½ deck screen, eliminating scalping screen. Sand is rejected by half deck. Throughs go to pay hopper, they never reach a crusher. Oversize goes to jaw crusher where "force-feed" increases production.

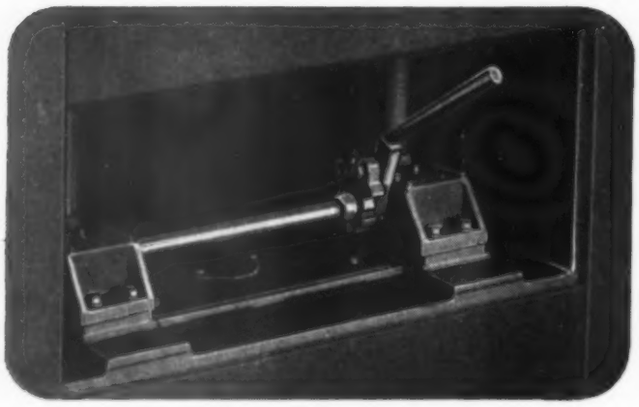


2 **ONLY CRUSHED ROCK** is screened by top deck. Specification material is *chuted around bottom deck*—not through it. Top deck produces independently from bottom deck doubling the effective screening area. Stone chips can be produced without extra equipment.

Only bottom deck feed* gives you these 2 high output features—

- ***TWICE THE PAY SCREENING AREA*** because both top and bottom decks produce specification material—independently—at the same time.
- ***MORE CRUSHING CAPACITY*** because the load can be balanced between the crushers *without stopping the plant.*

** Exclusive with Pioneer Duplex Gravel Plants.*



3 **THIS SIMPLE RATCHET** on the jaw crusher balances the load between the two crushers *while the plant is operating.* It is not necessary to change screens. When material is coarse, the jaw is opened. If pit run is fine, the jaw is closed.

4 **PIONEER MAKES FOUR SIZES** of duplex gravel plants with bottom deck feed. This Diesel-Electric Plant is the fifth bottom deck feed plant owned and operated by Winston Brothers. A new booklet tells all about bottom deck feed. Send for it today!

BUY BOTH!

Higher Output, Lower Upkeep!

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Minneapolis 13, Minnesota

Please send me your new booklet telling all about Bottom Deck Feed.

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NOW YOU CAN MOVE DIRT *at still lower cost!!!*

NEW LOW PRICE
$24,875

Sensational Price Reduction of LaPlant-Choate Motor Scrapers Cuts Earthmoving Costs Again!!

Here's your opportunity to really make money on earthmoving jobs. At this new low price, LaPlant-Choate Motor Scrapers can compete successfully with track-type tractor-scraper units on hauls of 400 feet and up, and are way ahead of other rubber-tired scraper hauling units at any distance. Look at all the features—in addition to new low first cost—that mean you can bid lower and still make a good profit. More yards per trip—more trips per hour—because of:

MORE POWER—225 h.p. Buda Diesel engine provides over 16 h.p. per struck yard of capacity—plenty of "zip" up and down grades in any material.

BIG TIRES—21:00 x 29 20-ply rating, tapered bead, traction-type tires interchangeable front and rear provide ample flotation and traction.

HYDRAULIC STEERING—Positive, double-acting, effortless steering. No jackknifing—no "nosing" or "hunting". No road shock thru steering wheel.

4-WHEEL AIR BRAKES—350 sq. in. of braking surface on each wheel. Safer, surer stopping.

MODERN POSTWAR SCRAPER—14 yd. struck capacity—17.5 yd. heaped capacity LPC scraper embodies all the latest improvements for faster, easier loading, hauling and spreading and definite lower yardage costs.

Your nearest LPC distributor will give you the latest information on deliveries. Contact him today!

LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa;
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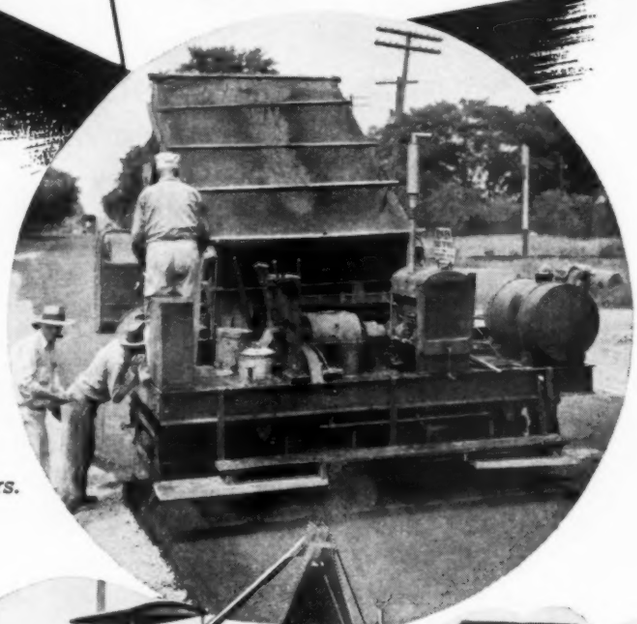
LaPLANT-CHOATE

HIGH SPEED EARTHMOVING EQUIPMENT

LOOK US UP AT THE ROAD SHOW

BOOTH 3106
South Concourse



We'll be there ready for your questions; all set for you to look us over. We'll be in operation—running with the wheels going 'round so you can see MultiFoote simplicity, Adnun Screed action and the unusual mixing action of the Kinetic Asphalt Mixer. We will all be there, the big Duomix (Double Drum) 34-E Concrete Paver, the MultiFoote Single Drum 34-E Paver, The Adnun Black Top Paver and the Foote Kinetic Asphalt Mixer.

Look us over July 16-24 at Soldier Field, Chicago, Booth 3106, South Concourse. We invite you to make *Our Booth Your Headquarters.*

THE FOOTE COMPANY, INC.
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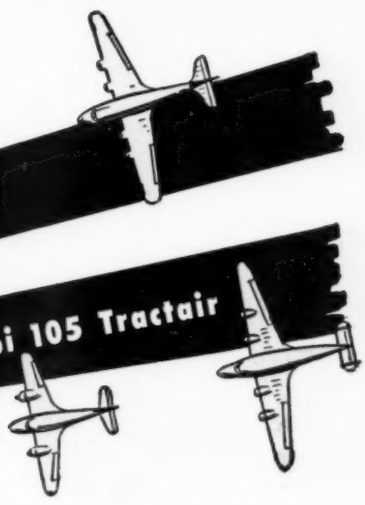
FOOTE

MULTIFOOTE CONCRETE PAVERS
ADNUN BLACK TOP PAVERS
Kinetic ASPHALT MIXERS

"the Handiest Tote Rig on the Job"

. . . that's what they said at Patterson field

. . . that's what they say all over, about Le Roi 105 Tractair



Tractair's usefulness is increased still more when you fill its tool box with Le Roi-Cleveland Air Tools . . .

Handy is the word for this combination 35-hp wheel tractor and 105 cfm air compressor. Thanks to interchangeable front-end equipment and its own air power, Tractair sweeps, mows, and loads — tows, plows, and pulls — drills, bores, and digs.

Tractair is Econotrol-equipped so that it supplies air economically and maintains high average working pressures. You get still more out of Tractair when you use Le Roi-Cleveland paving breakers, spades, backfill tampers, and hand-held drills. The efficiency of these tools is such that they use little air while doing a lot of work.

Your Le Roi distributor can show you what we mean when we say "Tractair and Le Roi-Cleveland Air Tools save you money." See him soon and write us for our latest catalog, too.

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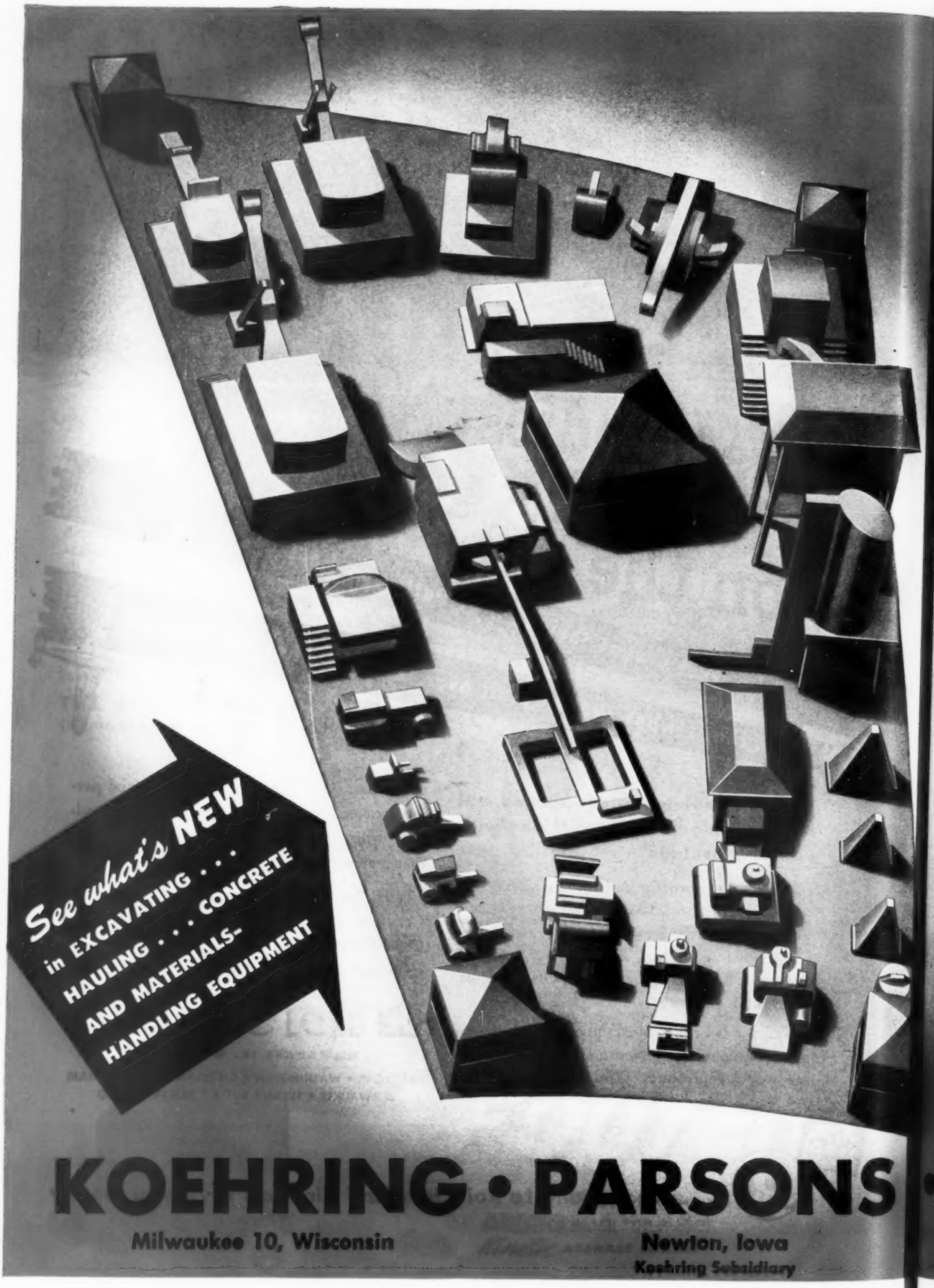
T-8

. . . Tractair and Le Roi-Cleveland Air Tools save you money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Don't miss this big EQUIPMENT "FAIR"

YOU are due for a big surprise at the 1948 Koehring equipment fair. In one big round-up of excavating, hauling, concrete and materials-handling equipment, you are going to see accumulated postwar changes and cost-cutting improvements in more than 25 modern machines from the complete line of Koehring and subsidiary products. In the exhibit you are going to preview many completely new machines . . . revolutionary developments that will start you figuring for new lower costs and bigger profits.

It's an event you can't afford to miss!

Time: July 16-24 *Place:* Soldier Field, Chicago Exhibit Booth 3010 *Event:* 1948 Road Show

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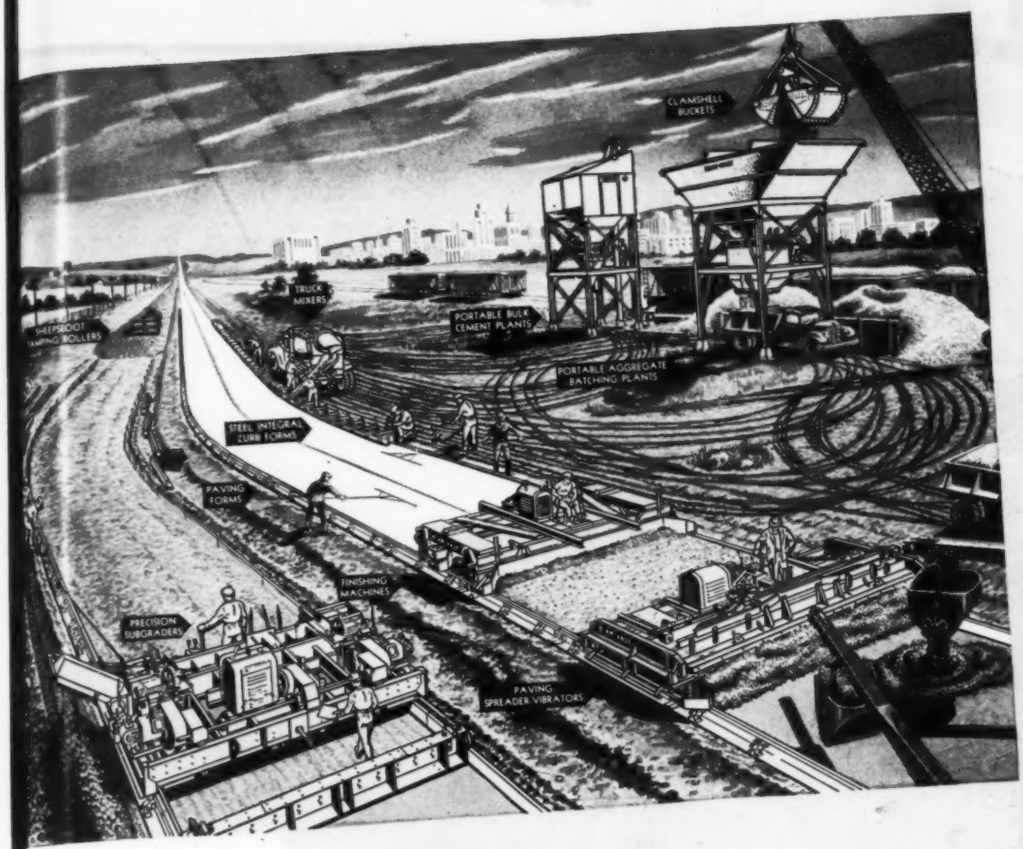
Preformed . . .
Preformed wire rope extends its influence far across the whole industrial world.
Because each of its components is preformed to its ultimate form, preformed wire rope is comparatively stress-free. It can work with all its strength — longer. Ask your own wire rope manufacturer or distributor for Preformed.
Write to the Preformed Wire Rope Information Bureau, 520 N. Michigan Avenue, Chicago 11, for an illustrated booklet telling the complete story of Preformed Wire Rope.

The BLAW-KNOX EXHIBIT MAKES YOUR ROAD SHOW TRIP WORTH-WHILE



- Steel Street Forms
- Steel Paving Forms
- Precision Subgraders
- Concrete Paving Spreaders
- Finishing Machines
- Paving Vibrators
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- Cement Batching Plants
- Ready Mixed Concrete Plants
- Truck Mixers and Agitators
- Concrete Buckets
- Clamshell Buckets
- Steel Forms for Dams, Tunnels, Bridges, etc.
- Prefabricated Steel Buildings
- Steel Grating

See this *NEW* equipment in actual operation

If you're planning to make money out of the big road-building program don't miss this "unveiling" of brand new and improved mechanized equipment by Blaw-Knox.

You can push buttons, pull levers or relax in an easy chair and watch movies of the same equipment in actual use on construction projects. You'll be convinced that Blaw-Knox has paved the way to faster, better, more profitable paving.

Blaw-Knox Division of Blaw-Knox Co.
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BLAW-KNOX THE ONLY *SINGLE* SOURCE FOR COMPLETELY MECHANIZED CONCRETE PAVING MACHINERY

P&H Single Pass

PROCESSING 3,000 LINEAR FEET PER DAY

cuts the cost of road building

Here, in Mississippi, as in many other states, the P&H Single Pass Soil Stabilizer is setting up new standards in producing good, all-weather roads more quickly — and at lower cost.

This 10½ mile stretch of road, 22 feet wide and processed to a depth of 6 inches, was completed in only 21 working days.

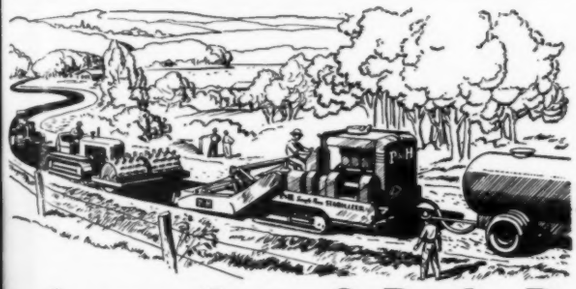
Maximum utilization of native, in-place soils reduced the need for importing foreign materials, thus reducing materials costs to a minimum.

With the complete processing accomplished by the P&H Stabilizer, the only auxiliary equipment required included a disc type plow, one sheep's foot roller and tractor, rubber tire roller and one motor grader.

Accurate control of all factors such as uniform processing depth, thorough pulverization, accurate proportioning and blending, including liquid etc., made it possible to meet specifications exactly and produce a road of predetermined load carrying capacity. Complete information is available on request.

Soil Stabilizers

Another example of P&H *Speed and Efficiency*



THESE ARE THE FACTS ABOUT THE JOB

Location of project — Highway 19, Lauderdale County, Mississippi — from Alabama line to Vimville.

Length of project — 10.48 miles.

Width of roadway — 22 feet.

Depth of treatment — 6 inches, compacted.

Type of soil — Natural soil of A-2 Classification with PI of 5 or less and Clay having PI of 19 Combined with sand to produce material of A-2 Classification.

Stabilizing agent — Asphalt — R.C.2 (4.32 gallons per square yard equal to 7% by weight of dry soil).

Rate of production — Approximately 3,000 linear feet per day.

Traffic was maintained through this road during construction.

erforms these 8 Basic Requirements in a Single Pass

re again, the P&H machine proved its ability fulfill these 8 basic requirements of soil stabiliion with definitely predetermined results.

Control processing depth for accurate proportioning.

Pulverize the soil thoroughly.

Blend materials uniformly.

Create a true sub-grade.

Disperse the liquid through the entire volume in measured quantity.

Mix the coated material uniformly.

Lay the completely processed material in a fluffy, even depth, ready for compaction.

Do all these things in one pass—at a good rate of speed.

The P&H Single Pass Soil Stabilizer is capable of handling any type of admixture. If you are considering the construction of base courses, secondary roads, airport runways, etc., investigate the performance of the P&H Single Pass Stabilizer under conditions similar to your own. Ask for the facts.

P&H

SINGLE PASS STABILIZER

4496 West National Avenue
Milwaukee 14, Wis.

HARNISCHFEGER CORPORATION

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prevent this!

use modern treated lumber!

decay termite Protected WITH PENTACHLOROPHENOL

Highway administrators and the crews maintaining signs, guardrails and other public construction are quick to see the advantages of Pentachlorophenol-treated wood. Men concerned with the budget are impressed by the full strength protection Pentachlorophenol gives against wood decay—protection that *lasts through the years;* that *cuts maintenance costs.* They also appreciate Pentachlorophenol's constant uniformity that gives *measured* control enabling the duplication of service records. Moreover, workmen like Pentachlorophenol-treated wood because it's easy to handle. Pentachlorophenol-treated wood is clean, nonsticky and is readily paintable when the proper oil solution is used.

Pentachlorophenol is applied to wood at low concentrations in petroleum oils by established pressure and nonpressure methods. It is available in quantity *now.* Capitalize on Pentachlorophenol's *additional* advantages—use Pentachlorophenol-treated posts and lumber.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

GET THE FACTS TODAY! *Send for free, illustrated booklet telling how Pentachlorophenol adds years to building life. Ask for booklet PE 72.*

DOW

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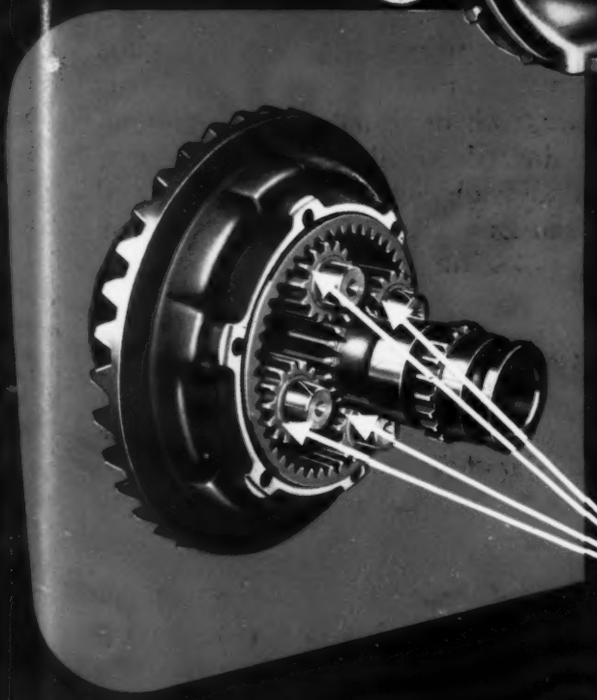
TO INDUSTRY AND AGRICULTURE

EATON 2-Speed Truck AXLES



Stand up Longer because Tooth Load is Distributed over 4 Planetary Gears

With 4 gears to transfer power, the rugged planetary system in the Eaton 2-Speed Truck Axle provides far greater gear tooth contact. Tooth-loads are distributed, and the load on the teeth is held to a minimum. Direct advantages of this design are reduced wear, longer axle life, and minimum upkeep. Outstanding performance records are proof of Eaton quality and design. See your truck dealer for complete information about Eaton 2-Speed Truck Axles.

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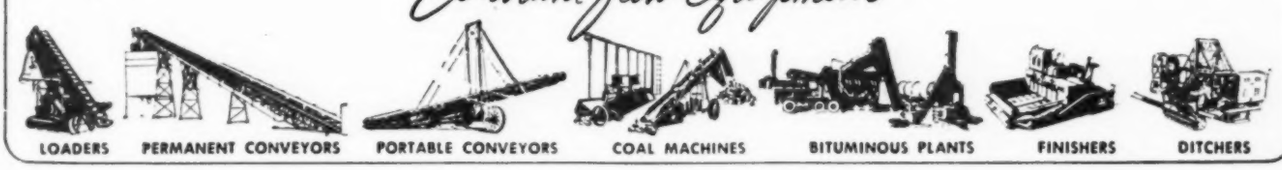

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The Vickers Hydraulic Power Steering Booster is compact, rugged, powerful. Installation is simple and requires minimum space. Lubrication is automatic. Write for Bulletin 47-30 for all the facts about Vickers Hydraulic Power Steering.

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WHEN A BLUE BRUTE PAVER SET THE PACE...

A Blue Brute 34E "Dual Drum" Paver on U. S. Route 422, in 1947, showing the "live" boom-and-bucket in action.

The same Paver in October, 1946, pouring concrete on Route 1, near Newark, N. J.

No paving job moves faster than the pace set by its paver. That's why S. J. Groves & Sons Co. selected Ransome Blue Brute 34E Dual Drum Pavers for jobs where fast performance was a "must".

Speed counted on the new 3-lane U.S. 422 between New Castle, Pa., and Youngstown, Ohio, delayed by abnormally heavy rains and lack of skilled manpower. Here a Ransome Blue Brute 34E Dual Drum Paver set the remarkable pace of ½ mile per day. This was the very same Blue Brute, incidentally, that performed a rush job the year before on U. S. 1 near the Newark, N. J. Airport. Here, fast-growing traffic demanded a tremendous widening project in a hurry.

That's where the 34E's many advanced features proved themselves. For example: *the fool-proof, self-cleaning, fast-charging skip . . . mechanically operated batchmeter for all-weather accuracy . . . precision water-measuring . . . and the exclusive, hydraulically operated "live" boom-and-bucket combination that spreads as it swings, cutting down costly hand shovelling.*

Geared to the output of the Blue Brute Paver, these large-scale paving operations were carried out smoothly . . . economically . . . on time! And that's why a Ransome 34E, Single or Dual Drum, on your own construction jobs will lay more yardage . . . more accurately and with less manpower ...than any other paver. For full details, see your nearby Worthington-Ransome Distributor, or write for Bulletin 208.

RB-5

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Your Blue Brute Distributor will be glad to show you how Worthington-Ransome construction equipment will put your jobs on a profitable basis.

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Pavers, Portable and Stationary Mixers, Truck Mixers, and Accessories.

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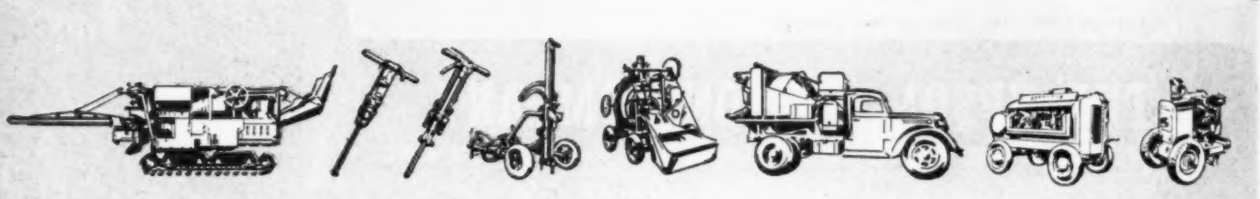
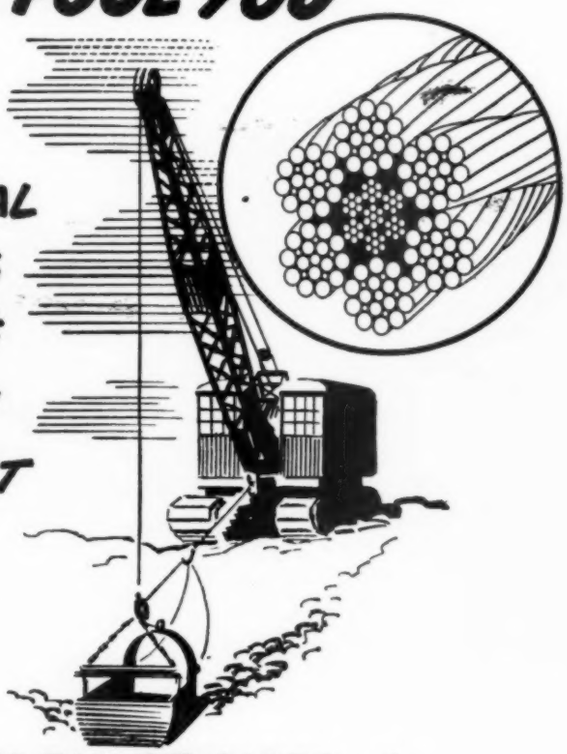


IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

SOME ROPES FOOL YOU



U-W 6×16 FILLER WIRE IS IDEAL FOR DRAG CABLES ON DRAG LINE EXCAVATORS BECAUSE IT IS SUFFICIENTLY FLEXIBLE AND ABRASION RESISTANT

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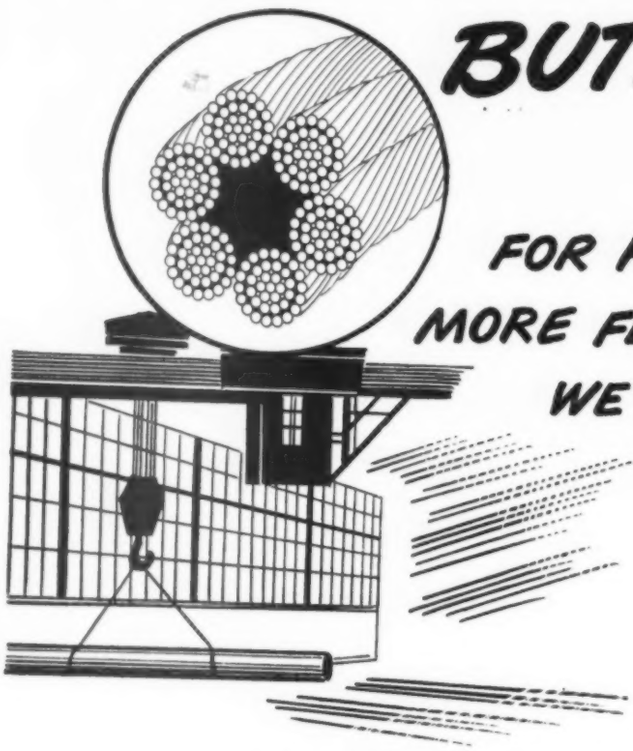

FOR FACTORY CRANES A MORE FLEXIBLE ROPE IS BETTER WE RECOMMEND U-W 6×37 CONSTRUCTION FOR THIS PURPOSE

For longest and best service, always specify
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the Torque Converter makes the Difference

When it comes to bulldozing there's nothing like a torque converter equipped HD-19 and Baker Bulldozer. The Torque Converter makes all other bulldozers obsolete — provides faster operating cycles, more operator comfort and efficiency, and greatly increased yardage at greatly reduced cost per yard.

And there's nothing like a Baker Hydraulic Bulldozer to go with the HD-19. Simplified engine mounting, sturdy construction, five stage blade tilt positions, plus the reliable fast-acting Baker hydraulic system, all contribute to the increased yardage a Baker will produce.

BAKER MFG. CO., Springfield, Illinois

LESS SHIFTING

Forward and reverse is all the operator is concerned with. All other speeds are automatic — the torque converter *automatically* selecting the highest speed in relation to the load. No other tractor — on tracks or rubber can match it.

HIGH REVERSE

Extra high reverse acceleration enables the HD-19 Bulldozer to cut operating cycles drastically. You don't require two-stage shifting to get into high reverse as on all other bulldozing units — the HD-19 reaches top reverse speed almost instantly and automatically.

FAST FORWARD

Forward travel speed is determined by the load — not the operator. The torque converter automatically adjusts the travel speed in relation to the load being handled — always the *highest* speed forward the load will allow. Cuts minutes from the operating cycle.

EASY ON EQUIPMENT

The cushioning effect of the fluid drive torque converter absorbs the shocks of tough operations. There is less strain and wear and tear on hydraulic systems and cable control units — and it's much easier on tractor parts as well.

SIMPLIFIED CONTROL

With shifting practically eliminated, the operator has only one control to watch — the blade control. He does more work, faster and better and is just as fresh at the end of the shift as when he started.

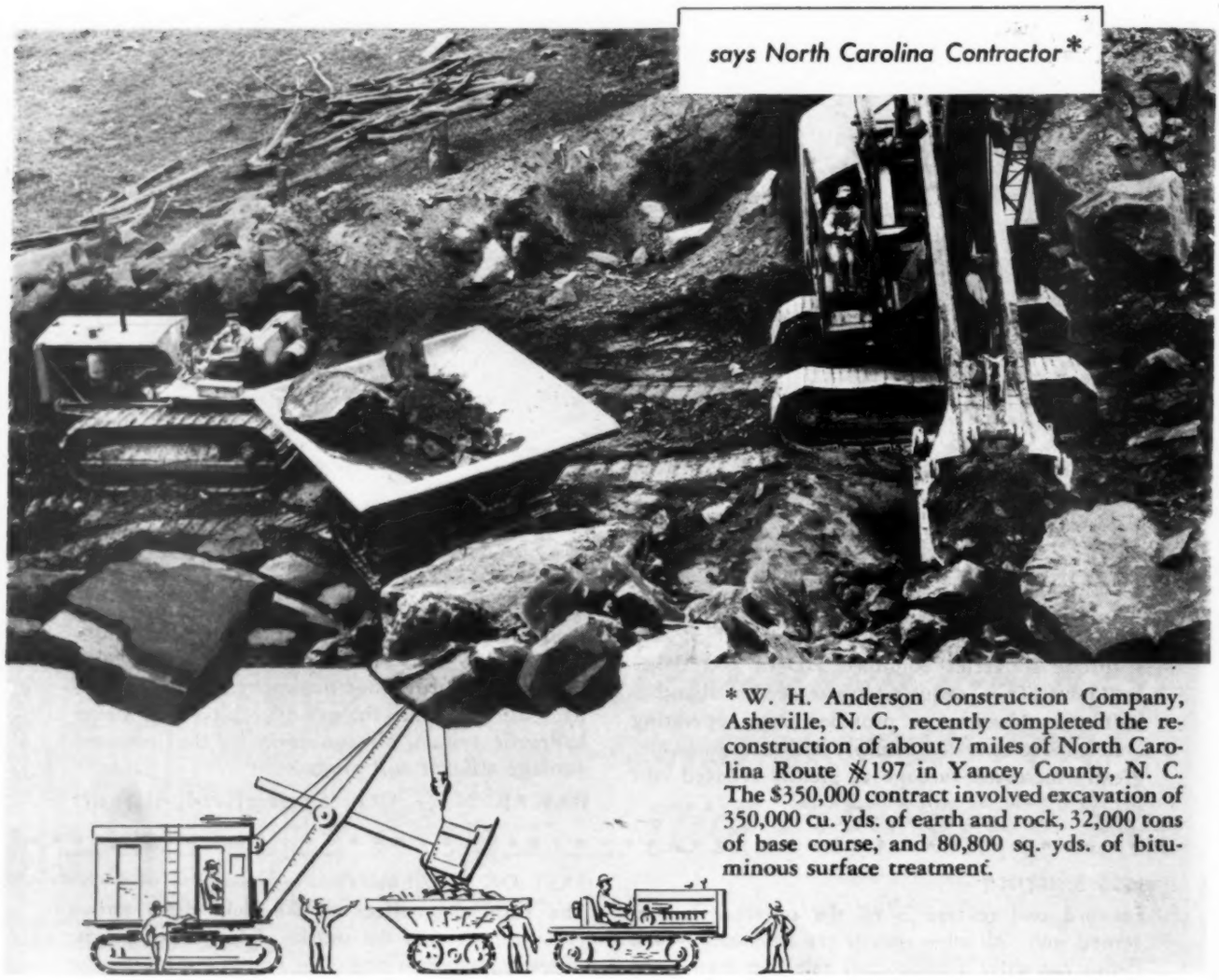
BAKER

They Go Together! BAKER AC

"Gulf Lubricants and Fuels

are a big help in beating contract schedules"—

*says North Carolina Contractor**



*W. H. Anderson Construction Company, Asheville, N. C., recently completed the reconstruction of about 7 miles of North Carolina Route #197 in Yancey County, N. C. The $350,000 contract involved excavation of 350,000 cu. yds. of earth and rock, 32,000 tons of base course, and 80,800 sq. yds. of bituminous surface treatment.

"WITH GULF LUBRICANTS AND FUELS, our equipment has given us outstanding service over a period of years," says this prominent North Carolina contractor. "On every job, we get the kind of lubrication and fuel performance that means smooth operation and freedom from mechanical delays—which add up to effective assistance in finishing ahead of schedule."

W. H. Anderson Construction Company is one of scores of leading contractors who have found that it pays to use Gulf lubricants and fuels on every job. Always of the same uniform high quality, Gulf products work as a team to keep equipment operating at maximum efficiency and at minimum expense for maintenance.

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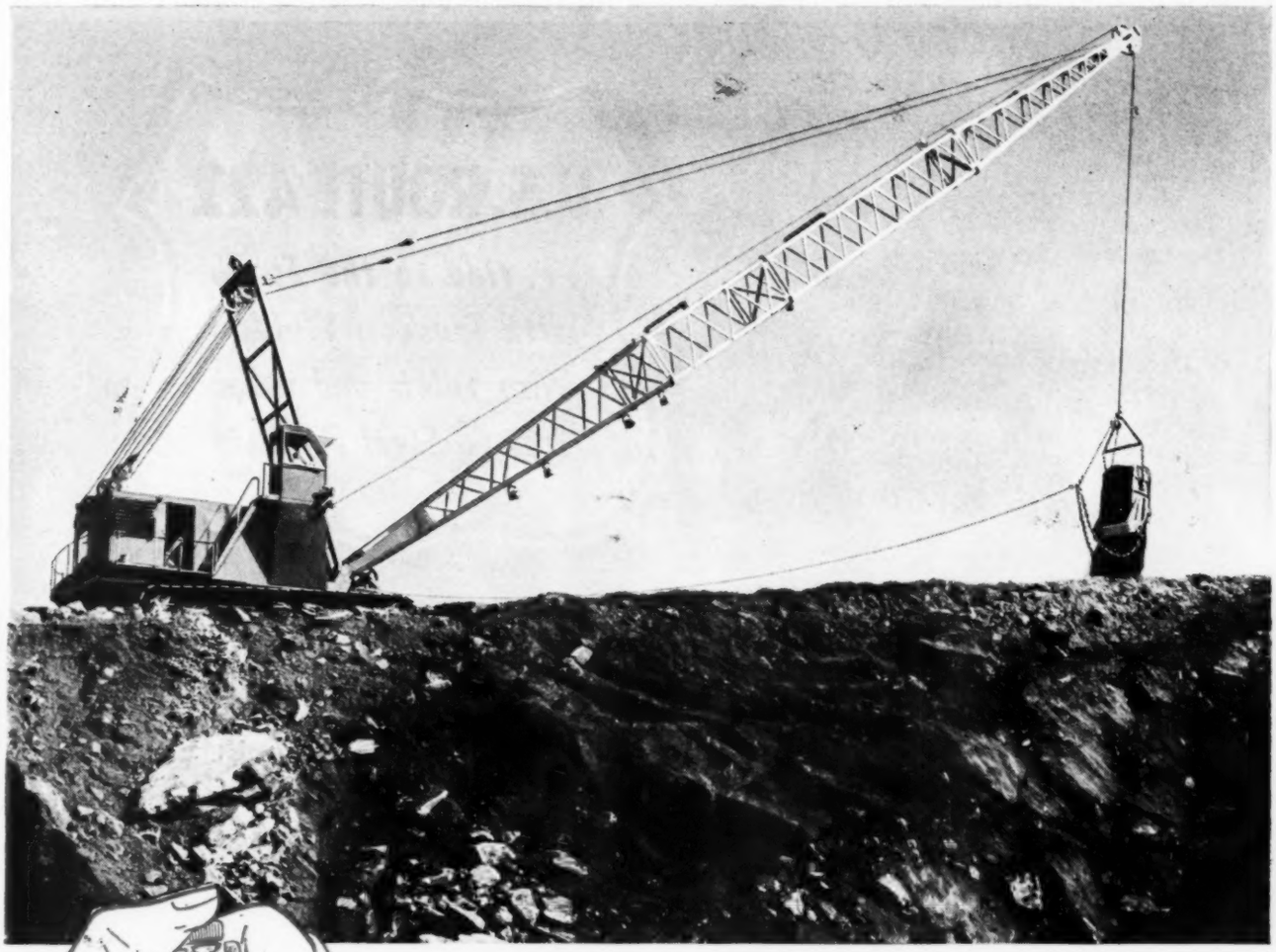
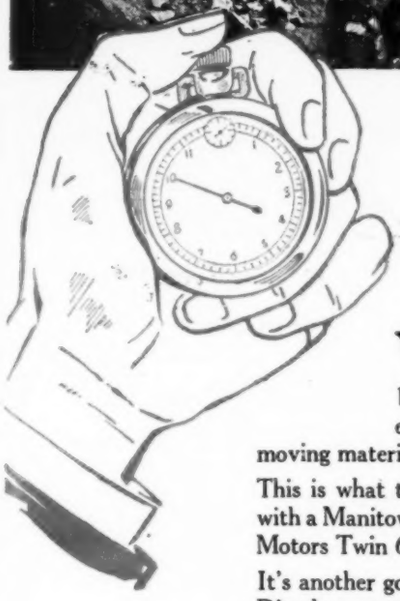


Manitowoc crane and dragline owned by the Coal Rain Coal Co., Junedale, Penna., and powered with a General Motors Series 71 "Twin" Diesel engine.



A pass every 50 seconds

WHEN you drag a four-yard bucket from the end of a 140-foot boom and make a pass every 50 seconds, you're really moving material.

This is what the Coal Rain Coal Co. is doing with a Manitowoc crane powered with a General Motors Twin 6 Diesel engine.

It's another good example of what GM 2-cycle Diesel power can do. With power at every down-stroke, pick-up is fast, response is rapid, and there's unusual power for a Diesel so compact, so reasonable in size and weight.

GM "71" Diesels are setting performance records in all kinds of equipment. They step up production, cut down maintenance and lower fuel costs.

Isn't this the kind of power you want? It's certainly well worth looking into. So write today and let us give you full particulars.

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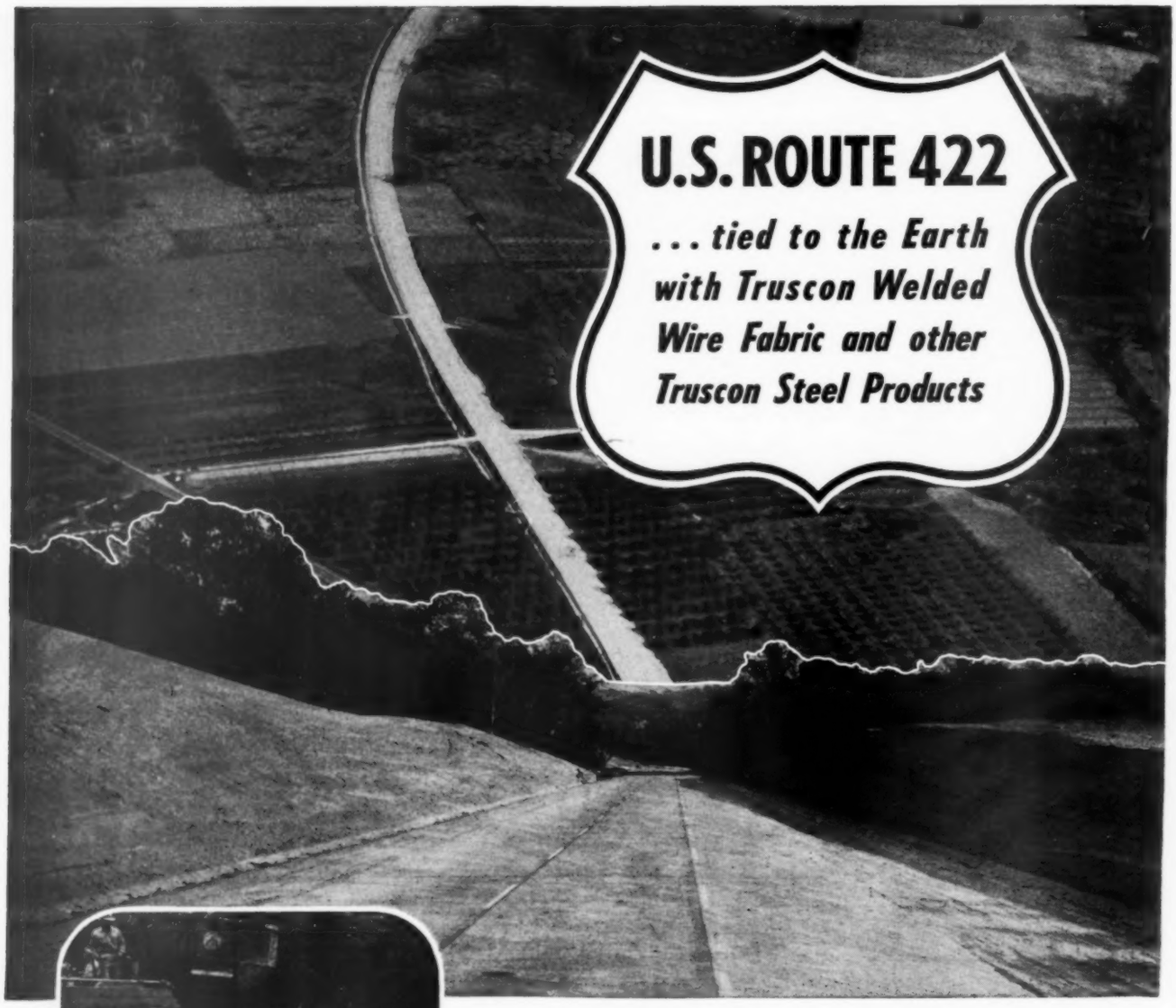
DIESEL BRAWN WITHOUT THE BULK



U. S. Route 422 between Youngstown, Ohio, and Newcastle, Pa., is reinforced with Truscon Welded Wire Fabric, Bar Mat, Dowels, Contraction Joints, Reinforcing Bars, High Chairs and Tie Wire. S. J. Groves & Sons Co., Contractors.

Great stretches of heavily-traveled American highways are assured long life and low upkeep by Truscon Welded Wire Fabric and other Steel Reinforcing Products. The engineers and designers on these projects have found by experience, practice and research that Truscon Welded Wire Fabric offers these advantages:

Provides resistance to cracking due to shrinkage of concrete during setting period.

Provides tensile strength necessary to resist subgrade friction caused by expansion and contraction of the concrete slab.

Provides increased resistance to cracking of concrete due to warping.

Provides resistance to the development of microscopic cracks into visible cracks.

Provides resistance to cracks opening and allowing entrance of water.

Provides resistance to broken ends of slabs separating at a crack.

Decreases spalling and progressive disintegration of the concrete.

Use Truscon Welded Steel Fabric with other associated Truscon roadbuilding products, and assure lasting prestige for you and more permanent highways for the communities you serve.

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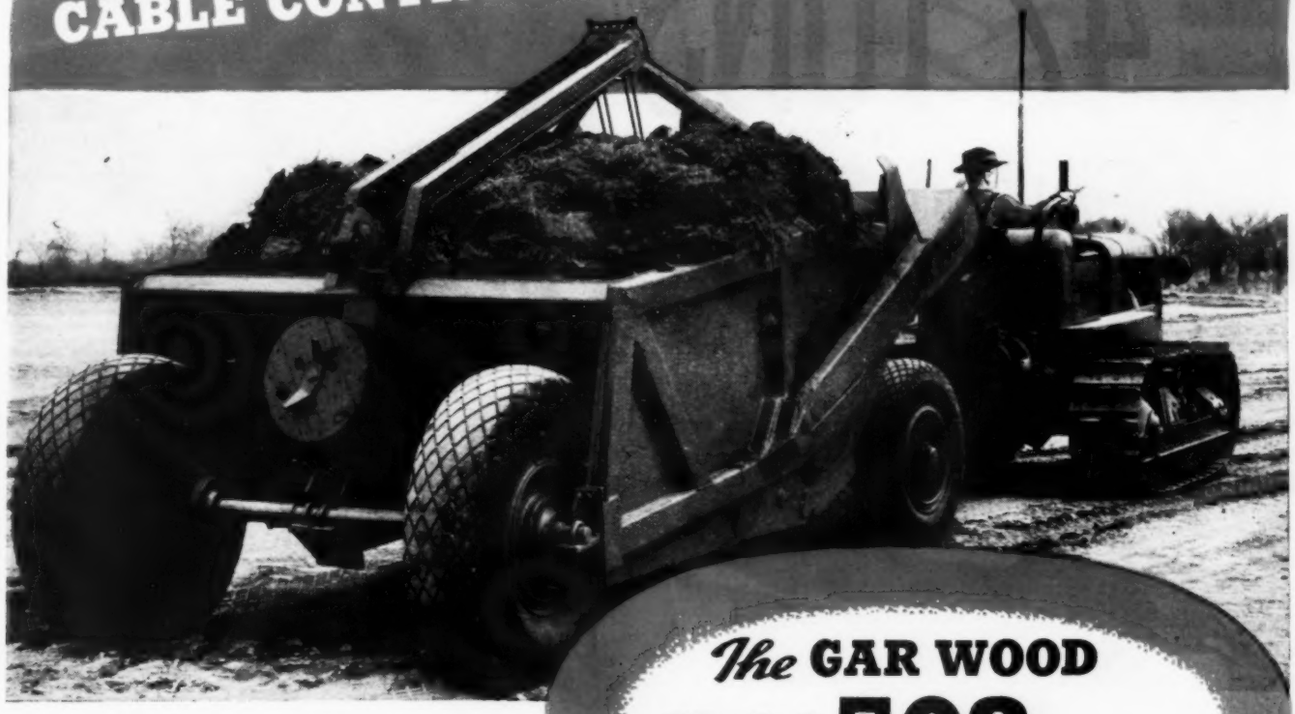
Manufacturers of a Complete Line of Welded Steel Fabric . . . Concrete Bars . . . Contraction Joints . . . Dowel Assembly Units . . . Curb Bars . . . Complete Steel Buildings.

NOW!! A NEW GAR WOOD CABLE CONTROLLED 4-WHEEL SCRAPER



The GAR WOOD Model 508

Immediate Delivery

Here's a brand new 4-wheel scraper designed from the ground up for use with a single tractor of 55 h.p. and up. 7.6 cu. yds. heaped capacity (6 cu. yds. struck). Hogs out a deep cut down to 12" below tires, and cascades dirt up into the bowl—no belaboring of tractor. Has all the rugged construction and work potential features of the larger Gar Wood scrapers which have long been proven on the toughest jobs. Simple straight line cable reeving saves cable and makes replacements easy. Pivoted type bowl with less friction. Fast, fully-controlled dumping and spreading. High bowl clearance for soft footing. A tailor-made earthmover for township, county, state highway departments, pond or tank, levee and right-of-way work. See your nearest Gar Wood—Allis-Chalmers dealer, or write for complete information.

See all the improved Gar Wood Products at the Road Show.

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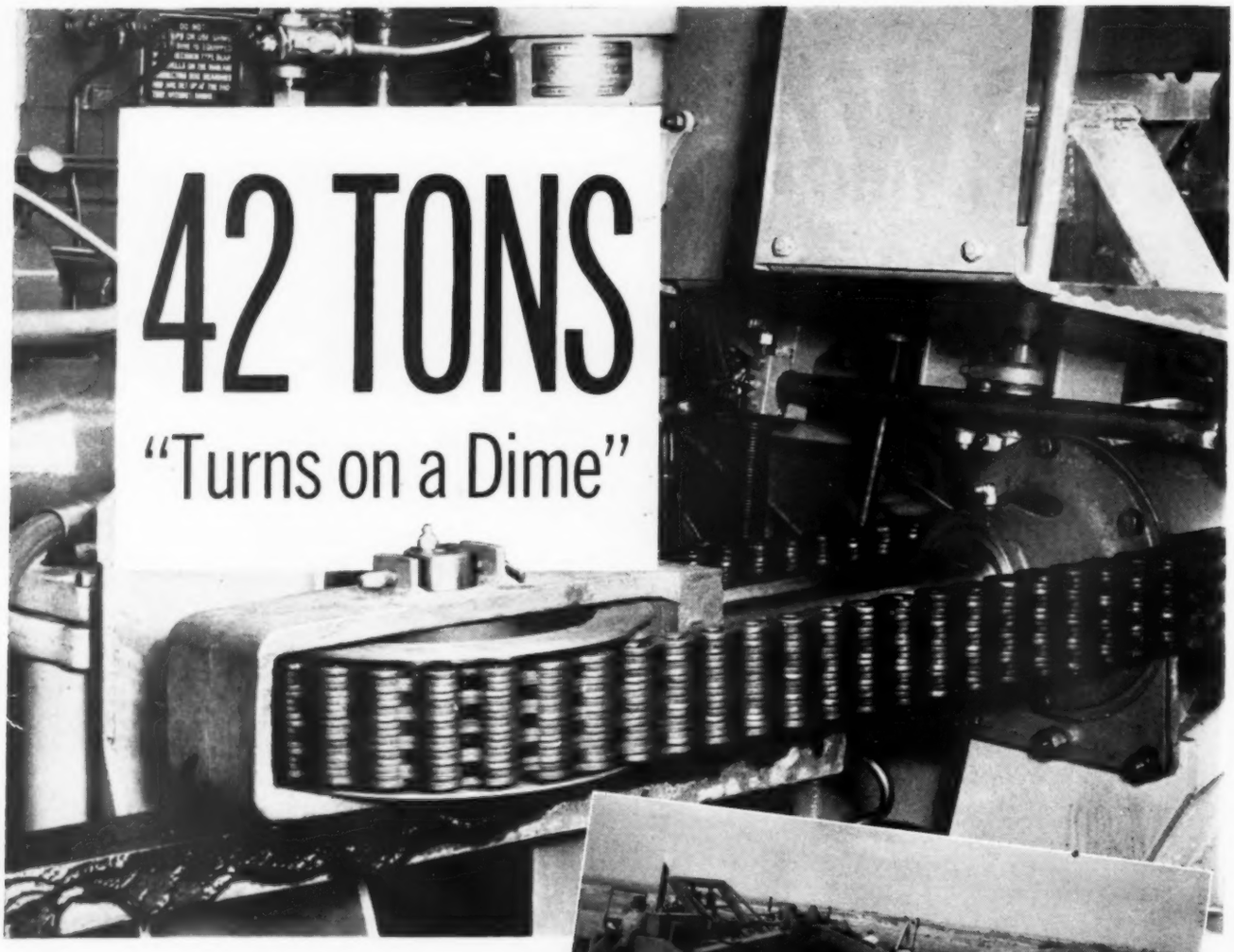


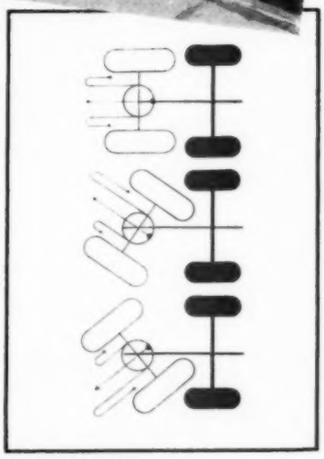
WHITNEY *Chain*

Helps give Terra-Cobra positive steering

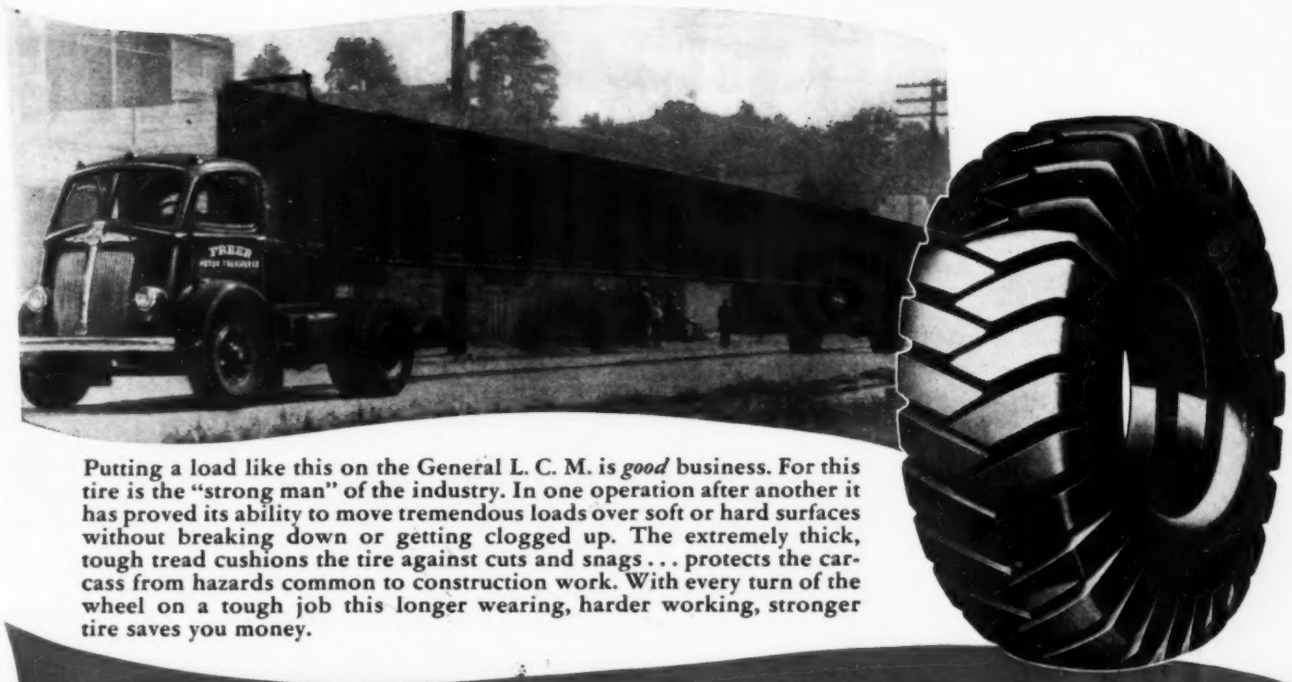
The Wooldridge Terra-Cobra — massive self-propelled earth-mover — features among its advantages a unique two-wheel hydraulic steering mechanism. Actuated by the steering arm, the front wheels carrying the motor unit are swivelled and automatically locked at the desired degree of turn or travel until the operator wishes to change his direction. This "tru-control" steering means higher travel speeds without fear of jackknifing even on soft shoulders or embankments.

To assure positive transmission of power from the hydraulic pistons to the steering wheels, Wooldridge uses *Whitney* 1¼" pitch, 8 x 8, special cable chain. And for a good reason — these husky alloy steel chains easily withstand the severe high loading and shock loading conditions encountered in earth moving operations. For additional dependability, Whitney Roller Chains are also used to transmit power from the motor to the driving wheels.

Whether your equipment involves earth-movers or machine tools, it is good business to *standardize* on Whitney Chains and Cut Tooth Sprockets . . . *the all steel drives.* Write for complete information and specifications.



WHITNEY CHAIN & MFG. COMPANY
Division of Whitney-Hanson Industries Inc.
216 HAMILTON STREET, HARTFORD 2, CONNECTICUT



Putting a load like this on the General L. C. M. is *good* business. For this tire is the "strong man" of the industry. In one operation after another it has proved its ability to move tremendous loads over soft or hard surfaces without breaking down or getting clogged up. The extremely thick, tough tread cushions the tire against cuts and snags . . . protects the carcass from hazards common to construction work. With every turn of the wheel on a tough job this longer wearing, harder working, stronger tire saves you money.

To move loads and equipment *Faster and at Lower Cost*...have your General Tire dealer specify, install and service the tires for the job!

Specialists in any field do a better job. That's why this combination of power wheel tires and rolling wheel tires, designed specially for tractor graders, save time and money. The big, low pressure tractor grader tire rides high in sticky going . . . rolls easily through mud, sand or gravel . . . cleans and grips forward or backward . . . withstands rocks, ruts and ridges. For front or trailing wheels of regular, or leaning wheel type graders the free rolling, tapered continuous ribs of the ribbed grader tire resists side slip, makes steering easy.

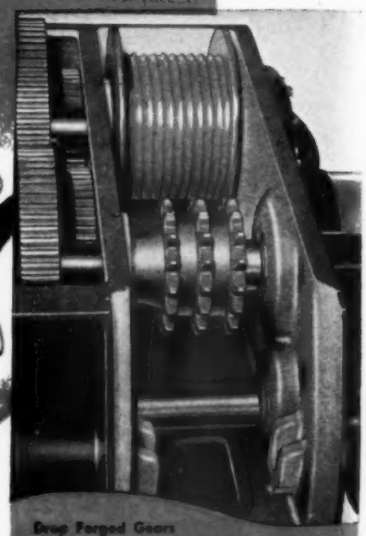
The GENERAL TRUCK TIRE

THE GENERAL TIRE & RUBBER CO.

AKRON, OHIO

THE "HEART" of Every UNIT

HUSKY ONE-PIECE CAST GEAR CASE



Drop Forged Gears . . . Involute Splined Shafts . . . All alloy steel and heat treated! Involute splines provide greater strength and eliminate wear . . . No keys to replace . . . No worn-out keyways. Forging "beats" toughness into these gears. Shafts are accurately ground for perfect alignment, and gears are precision cut to close limits.

EXCLUSIVE WITH UNIT!

- All gears and shafts are completely enclosed in a constant flow of oil . . . positive protection for all moving parts . . . no chance for dust or dirt to cause abrasive wear.
- Bored for perfect alignment by a machine designed specifically for this accurate operation . . . misalignment is impossible.
- Self-lubricating . . . this case eliminates the need for frequent greasing or adjustment.
- All clutches are smooth operating, disc type, and completely interchangeable. Mounted on the higher speed countershafts instead of directly to drum shafts . . . a modern, approved engineering practice.

Easy to service from all sides . . . Fewer parts . . . Lower maintenance costs! Gasoline or Diesel engines are mounted "straight-in-line" with main machinery in every model . . . Crawler or "rubber-tired" mobile UNITS available.

½ and ¾ Yard Excavators — Cranes . . . up to 15 tons

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A 5330-1P-C

Preparing for next Winter is a job for TODAY!

Order your WALTER SNOW FIGHTERS *NOW!*

EACH WINTER it happens . . . highway departments desperately in need of the Walter Snow Fighters they ordered too late for delivery by snow-time.

Each Spring and Summer we caution . . . order your Walter Snow Fighters NOW! This permits you to plan your purchases carefully—to set delivery dates—to avoid hasty, last-minute decisions and the necessity of taking "second-best" equipment in an emergency.

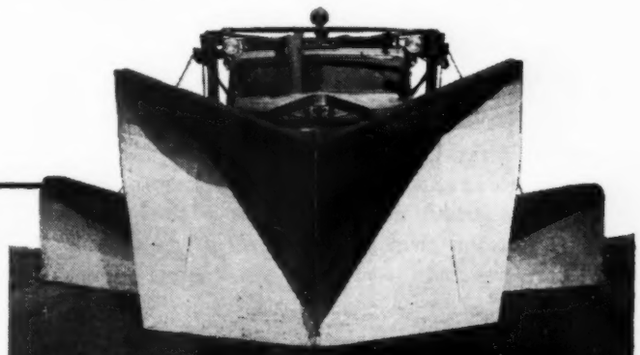
Our plant is busy producing Walter Snow Fighters and Tractor Trucks. Let us schedule your needs now. Your Walter distributor is ready to give you full data on the many superiorities of Walter Snow Fighters, and to book your orders. Meanwhile, write us for detailed literature.

CONTRACTORS!

***Send for* NEW BULLETIN**

"WALTER TRACTOR TRUCKS for TONNAGE HAULING"

• Gives full advantages of Walter Tractor Trucks for off-highway hauling of earth, rock, ore, coal, lumber, etc. Shows various models, specifications, etc. Write today for Bulletin No. T-83.



WALTER SNOW FIGHTERS

WALTER MOTOR TRUCK CO. 1001-19 Irving Ave. Ridgewood 27, Queens, L. I., N. Y.

Sure-Grip for Graders!

A right tire for each job

EARTH MOVER ALL-WEATHER
for drawn vehicles and general traction

HARD ROCK LUG
for super-stamina in all rock work

SURE-GRIP
—in grader or earth mover sizes — for maximum traction on drive wheels.

ON the drive wheels of work units—from road graders to giant earth movers—this is the tire that packs pulling power without equal. It's Goodyear's Sure-Grip—"right" on traction jobs because it's designed to bite in and bull through. That *o-p-e-n c-e-n-t-e-r* self-cleaning tread does it—makes each lug bar a *separate* traction cleat that takes firm grip with minimum slip, pulls sure and steady in toughest going.

That's why the Sure-Grip is *first choice* where pulling power comes first—just as every other job-proved Goodyear work tire is first choice for its special type of service. And consistent low-cost, long-life performance *keeps* them first choice—with the result that year after year, *more yards are moved on Goodyear off-the-road tires than on any other kind!*

BUY and SPECIFY GOODYEAR —*it pays!*

Sure-Grip, All-Weather—T.M.'s The Goodyear Tire & Rubber Company

GOODYEAR

BETTER ROADS FOR A BETTER WORLD · 45th Annual Convention and Road Show · SOLDIER FIELD CHICAGO · JULY 18-24, 1948

MORE YARDS ARE MOVED ON GOODYEAR OFF-THE-ROAD TIRES THAN ON ANY OTHER KIND

ROADS AND STREETS

JUNE, 1948 • VOL. 91 • No. 6

120-Unit Outfit Moving 7000 Yds. Daily on

California's Heaviest Road Job

Winston Bros. Company has two adjoining contracts for 8.2 miles of realignment and widening of US 99 "up on the Ridge"

Harold J. McKeever
Editor, ROADS AND STREETS

IT isn't often that you see a job like the current work of Winston Bros. company on US 99 north of Los Angeles. Along eight miles or more of road the contractor's men hardly know which they are battling hardest—yardage or traffic. Traffic is a special problem for two reasons. There is lots of it—some five thousand vehicles on busy days, including many big trucks. And the shovels and scrapers and rock trucks have to work immediately above or below the existing roadway, and travel across the pavement or along shoulders much of the time.

This extremely heavy project, or rather pair of projects, consists largely of widening and benching the deep cuts of the existing road and of widening and counterforting the road shelf and fills. Neither complete reconstruction to a new location nor detouring of traffic during construction was feasible. The design objective was to widen the old 3-lane roadbed to a width of 72 ft., under traffic, and at the same time ease curves and make any possible reductions in grade. When the new road is finished, vehicles streaming north out of Los Angeles will still have to climb steadily for many miles, with grades up to 6%. But they'll have four 12-ft. divided lanes and two 9-ft. paved shoulders—to all intents a 6-lane road—as they speed safely at 50 and 60 mph.

★ Millions of cubic yards of rock and shale are being moved to terrace widened cuts against slide danger, and to counterfort deep fill slopes for the same reason

★ Tractor-drawn scrapers were used here for hauls far beyond the normal economic limit, due to hazard of taking self-powered units up and down the steep, narrow haul roads

- **2½ million yards of excavation required to unkink and widen this heavily traveled mountain road artery and "unload" tops of cuts to obviate future slides**
- **450,000 cu. yd. in largest cut widening; fills being toed out as deep as 453 ft. below roadway**
- **Long distance piping of compaction water a construction feature; maintenance of traffic a major problem to contractor**

through some of California's "heaviest" scenery. Curves will be to 1500 ft. min. radius, as compared with 1,000 ft. formerly.

Two Adjoining Contracts

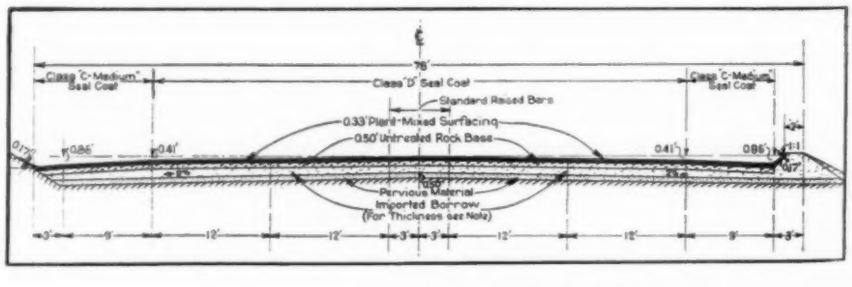
The Winston firm was awarded a 3.8-mile section May 29, 1947, involving 1,300,000 cu. yd. of roadway excavation and 2,400,000 sta.-yd. of overhaul. Bid for the complete job including drainage, structures, base and pavement, was $1,468,303. The excavation was bid at 54 cents—not high considering the amount of rock. Just possibly the contractors anticipated getting the adjoining 4.4-mile section. Sure enough, their bid was low, and on Feb. 6, 1948, they had an additional 1,100,000 cu. yd. and sundry items on their hands, for another $1,373,504. Excavation this time, 52 cents. Beginning at once, the Winston outfit spread out over the two jobs and operated them as one. With six or seven shovel-truck and tractor-scraper groups working a succession of cuts and fills, the combined project as seen in April, was a convincing demonstraton of the efficiency and economy of longer jobs where the work is heavy [see editorial this issue R&S]. The first contract will be completed late this year and the second early in 1949.

Thorough Advanced Engineering

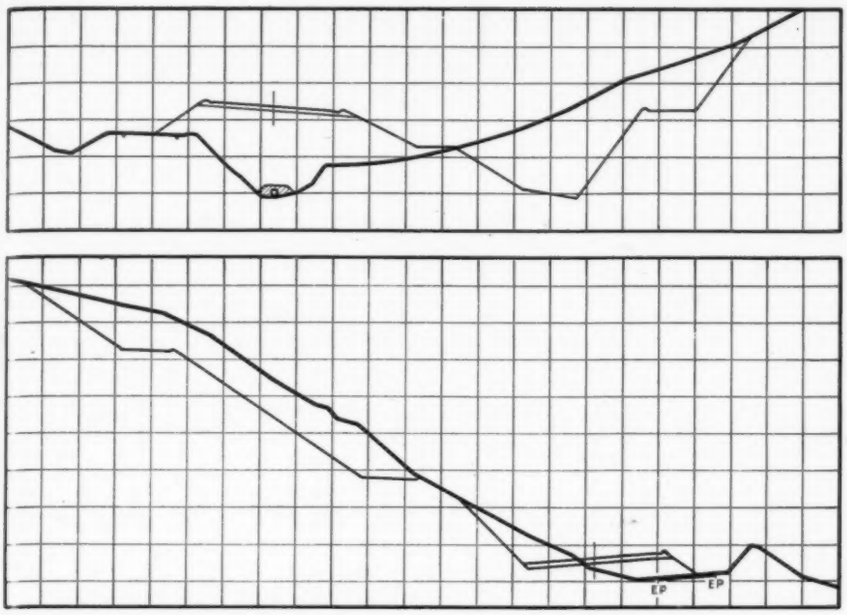
Before the US 99 projects were drawn up for letting, materials and design engineers in the California division of highways made an unusually thorough analysis of the existing roadbed and surrounding terrain. This road was built fifteen to twenty years ago to then-advanced standards. Cuts and fills approaching record depth involved shale and sandstone, with strata at various angles. The road has a history of slides, including some of serious proportions. Just prior to the war, one very high fill was largely rebuilt. The replaced portion was drained by an installation of 12-in. metal pipe, this pipe serving as a collector for numerous small lateral pipes tapping horizontal Hydrauger holes in the undisturbed portion.*

All in all, considerable engineering

*"California Highways and Public Works," by T. G. Stantop, Feb. '48, Roads and Streets.



★ Pavement and base were designed for extremely heavy duty



★ Typical cut and fill cross-sections, showing the terracing designed to "unload" slopes. Upper reaches of cut faces were sloped 2 to 1. Upper section shows how a line change was effected by moving nearly a mile of parallel creek laterally. (Grid lines at 20-ft. intervals v. and h.)

judgment was involved in deciding whether or not to reconstruct some of the old fills, which were known to have a high moisture content and a low safety factor against slides. Moisture tests from core samples were taken from the fills, using 1-in. diam. hand-operated Porter type sampling equipment. A rough check on density was obtained by recording the number of blows per foot of penetration of the sampler. Moisture content of some fills was also checked by means of Hydrauger holes. All existing cuts were investigated geologically.

As a result, it was decided to salvage most of the old cuts and fills. As a safety measure against slides, the plans provided for benching or "unloading" the upper reaches of cuts, and for utilizing this extra yardage to counterfort the deeper fills. Slide considerations resulted in nearly three times normal excavation quantities. Along one hillside location the new roadway was shifted outward over a parallel streambed, and the channel moved outward, rather than cut into a hillside having unfavorable drainage and strata (see accompanying figure). About 4,000 lin. ft. of 12-in. perforated corrugated pipe was installed in the old channel and blanketed with pervious material to a depth of 2 ft. over the pipe before placing new fill.

Many of the deepest existing fills are on horizontal curves, and such fills are being widened almost entirely on the inner side. Several of the individual cut widenings involve 200,000 to 450,000 cu. yd. of excavation, and fill slopes will often toe out at elevations 200 to 453 ft. below the roadway edge.

Culvert Pipe Extended

While some new drainage is being required, most culvert work consists of extensions. Several large concrete arches and boxes were extended, the larger structures being given new paved inlets carefully designed to insure maximum hydraulic efficiency. Some 15,000 lin. ft. of corrugated metal culvert pipe, 12 to 84 in. diam., was included in the bids. Pipe is being set with a truck crane, which does the necessary trenching, except where jackhammer work is necessary. Also to be placed is some 4,600 lin. ft. of 8 and 12-in. corrugated downdrains to protect cut and fill surfaces.

All fills are being benched before widening, at least 4 ft. of material being removed, or more material if required to reach undisturbed material of specified density; 80,000 cu. yd. was removed from a single fill to meet this specification. Some keying is effected by shelfing into the old fill at intervals. All natural ground or ravine areas under new fills are blanketed with at least 2 ft. of porous river-bed sand, to insure free outlet of moisture from the old fills, and also to prevent capillary rise of ground moisture.

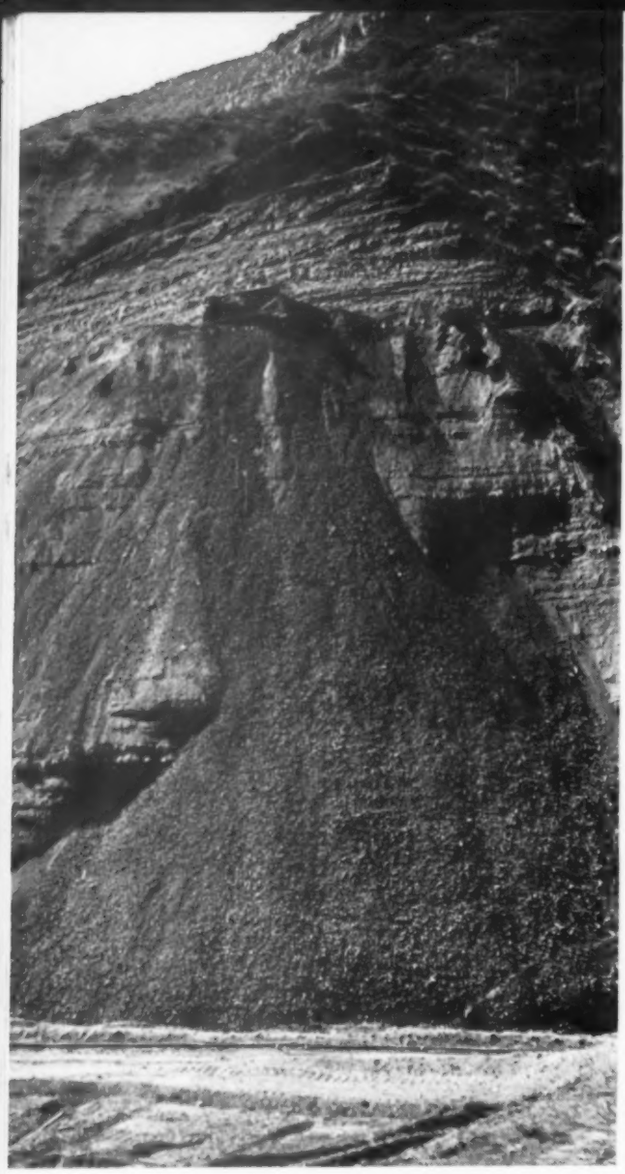
No end dumping is allowed, except occasionally for material that later is to be spread in layers and rolled. Equipment has to get clear down to the bottom, in other words, and this fact plus the narrow shelf has influenced the type of equipment selected for the work. Sheepsfoot rollers are small-diameter (42-in.) single axle dual-drum units, drawn by D7's or D8's, which can turn on a dime. Self-powered tractors are used only as auxiliary units, because of the steep haul roads. Applying water is brought in by pressure pipe and hose. All tractors with rollers also have dozers and make 2 or more passes to mix material for uniform moisture dispersion under the hose application.

No details of compaction procedure are specified other than that earth be rolled in 8-in. lifts and rock in 2-ft. lifts, and that material be compacted to 90% relative density. Embankment layers within 2½ ft. of profile grade are compacted in 4-in. layers.

Each Cut a Problem

Some of the cuts are in clay and are easy work for the scrapers, except that tractor-drawn units have been used on longer hauls than usual because the going is considered too steep and narrow for self-powered pans. Tractor-drawn scrapers have mingled with one and two-way roadway traffic, using the shoulders or slapping their

★ Trucks backed down to dump here. This narrow fill-widening is typical of the lack of normal turn-around space on most of the project



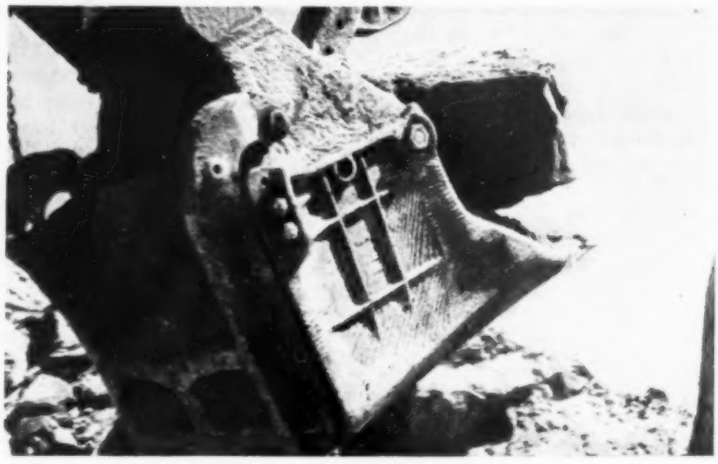
★ Showing again how cuts are widened alongside traffic. Three I-R wagon drills are shuttled from cut to cut

★ Shovels often worked ledge too narrow for efficient operation. Plenty of room here

Seen on the Ridge Job

★ Dozer operators put on quite a show, precariously working down from the tops of high cuts where shale and other softer material permitted

★ A thorough job of hardfacing—dipper surfaces inside and out, as well as teeth—was done here while the shovel was down for repair. Winston Bros. Company's repairmen keep the welding and acetylene trucks shuttling



★ Secondary shooting was needed in this cut —Chicago Pneumatic compressor supplied two jackhammers for the work

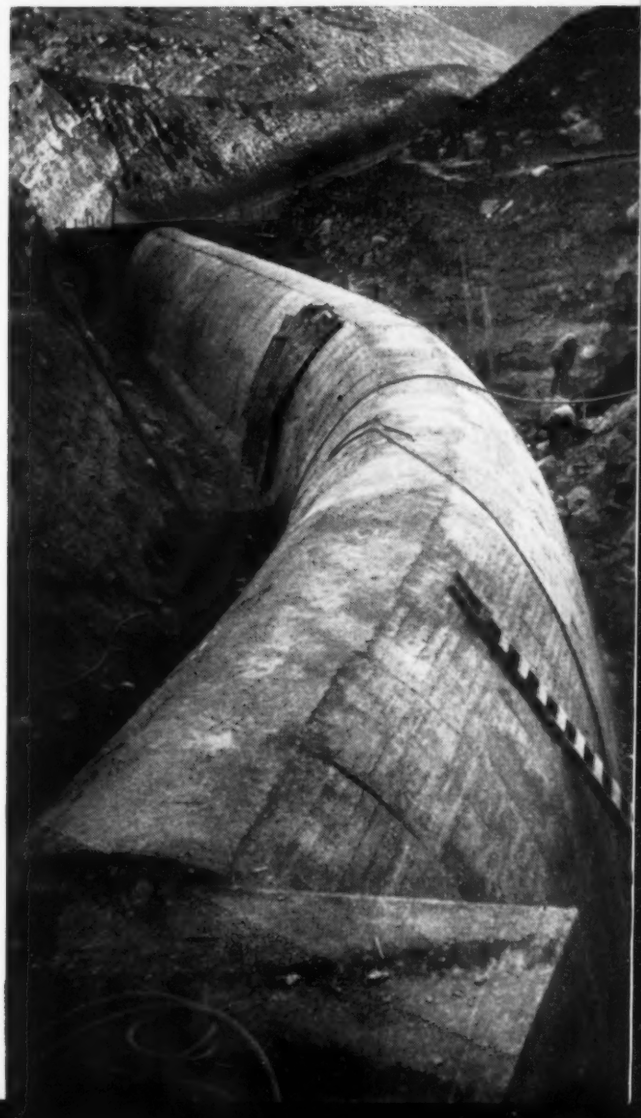
★ Two Sullivan 365's supplied wagon drills for this ledge. Shooting had to be done under flagmen at all times

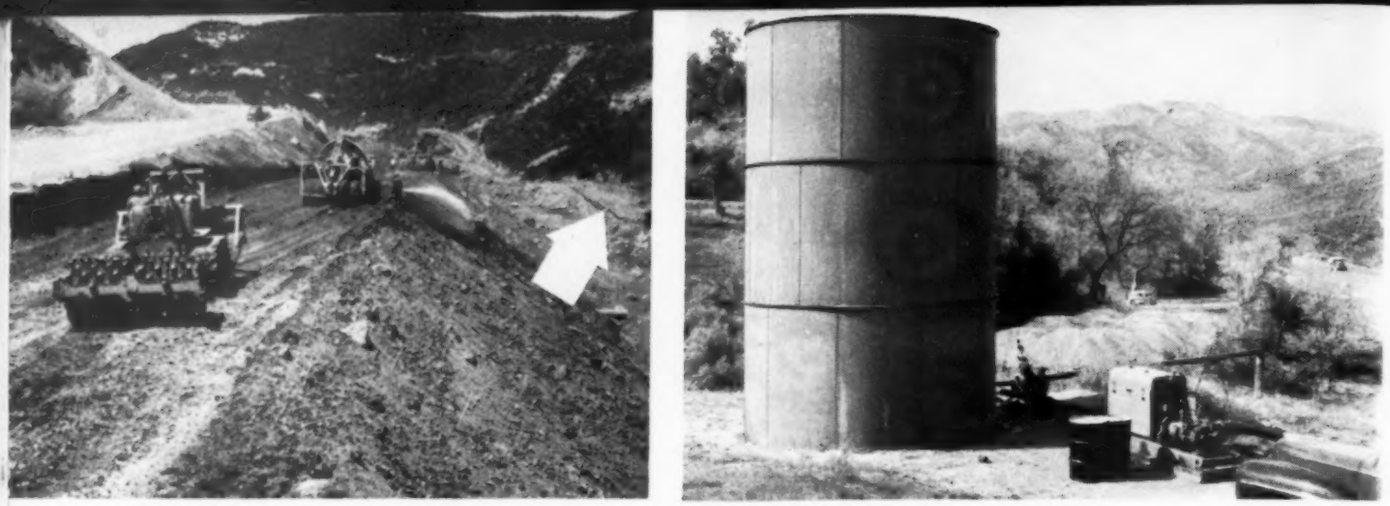
★ Winston's job manager H. J. Yount (bareheaded) and superintendent McAfee (at Yount's side) talking it over with highway department men

★ At quitting time dozers working singly or in pairs smoothed and cleared the existing roadway to render it safe for night traffic

★ One of several large concrete arch culvert extensions required on the project

★ This 12-in. corrugated pipe—nearly a mile of it—was laid along the old bed of a parallel channel, preparatory to relocating the channel to the right and widening old roadway fill seen at the left. [See also accompanying cross-section]





★ (At Left): Note stream from fire hose, principal means of delivery of compaction moisture. Arrow points to water pipe. (At Right): One of numerous 35,000-gal. storage tanks and 6-in. booster pump units strung along the job with 8 miles of war-surplus pressure pipe

lugs against hard black top.

Rock cuts are being worked with 2½-yd. shovels and 12-yd. rock trucks. Each cut has required careful study as to the best selection and routing of equipment and location of haul roads. In one case, for example, trucks backed down into a deep but short fill widening area, switch-backed, then backed in to dump, negotiating grades as steep as 25%.

One or more 365 cfm. compressors and jackhammers, wagon drills or both, work with each shovel.

The sandstone and shale have imposed no serious blasting problem, except for the variability of strata. Benching of cuts is often adjusted to make the most of inclined formations, special care being taken to cut away soft exposed material that might slough off later.

8 Miles of Pipe

The dry desert conditions require an estimated 46,000 M gal. of applying water for the two contracts. Because of the steep haul roads and great distances down to the lower lifts, and because of the infrequent sources of water, the contractor decided on piping. A maximum of 8 miles of 6-in. water pipe with couplings and frequent valved hose connections is being strung along the work. Two or more hose lines with high pressure fire nozzles are used to sprinkle the lifts in each cut, supplemented by water trucks at times as the rolling nears the level of the existing roadway. Four 2,500-gal. trucks with dual axles are employed. The pipe is war surplus, of a type designed for forward areas.

Water is being pumped by means of four 350 gpm. high-lift primary and booster pumps. The pipe line is laid up and down gulches with a maximum of 900 ft. rise and fall. Six 35,000-gal. water tanks are located on hill-tops along the work to act as reservoirs, being placed at sufficient height above adjacent fills to supply adequate nozzle pressure.

Base and Pavement

The embankments are being covered full width with 6 in. of pervious sand, to insulate against capillary rise and to insure proper drainage under the subgrade. Next is placed a minimum of 8 in. of imported borrow, consisting of crushed rock and binder with a high stability. The subgrade, also placed full width of the grade, consists of untreated rock base, being crusher-run material of high bearing value. Materials are tailgated, and a grader and two 10-ton 8-wheel rollers spread and compact the subgrade and base material in 4 in. lifts.

The surfacing consists of 4 in. of asphaltic plant-mixed material placed full width between bituminous curbs, with raised bars for a 6-ft. division strip at the center. Bituminous curbs or berms, to prevent washing over fill slopes, are formed with a grader and compacted with a small hand-drawn steel roller.

The subgrade base and pavement bid quantities are unusually large for a rural highway project: 140,000 tons impervious material, 168,000 imported borrow, 115,000 tons rock base, 85,500 tons plant-mixed bituminous surfacing, 600 tons emulsified asphalt and 1330 tons screenings.

Mobile Crushing Plant

Subgrade and base requirements of the north project are being met by a

Details of Winston's Aggregate Plant

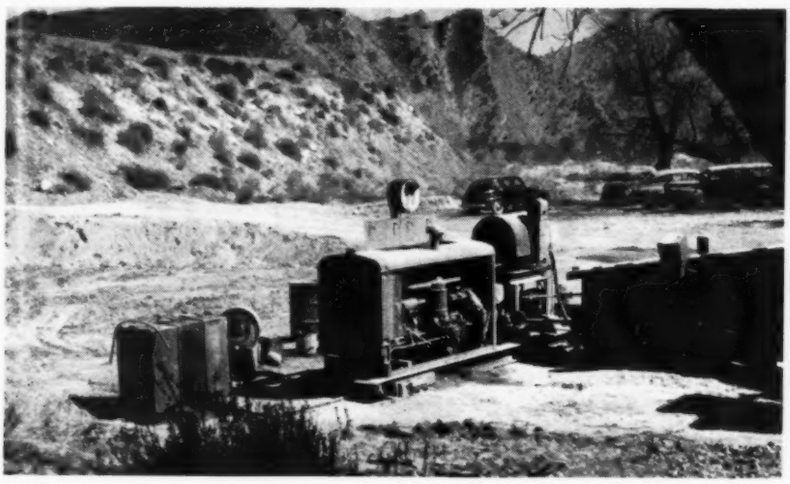
Pioneer duplex unit pictured consists of (1) mixing hopper and sand hopper with 6-in. grizzly; (2) 30″ x 50′ delivery belt, with 10 hp motor, bottom deck feed with sand screen; (4) 4′ x 10′ vibrating screen, with 10 hp motor; (5) 10″ x 36″ jaw crusher; (6) 40″ x 22″ roll crusher; (7) return conveyor with 24″ belt; 21 cu. yd. storage bin; 165-hp Murphy diesel generator set. Main plant unit on 3-axle rubber tired mounting, with 2 equalizers. Burt Harris, contractor's plant foreman.

★ A single truck crane (Lorain) handled most of the setting and trenching for corrugated pipe culvert extensions

★ Over half-million tons of base gravel and hot-mix aggregate are being turned out at rate of 1600 tons or more per 7-hr. day by this Pioneer No. 46VE Duplex crushing and screening plant, located 4 miles beyond end of job

Winston Bros. Company's modern aggregate plant as seen on US 99 California project

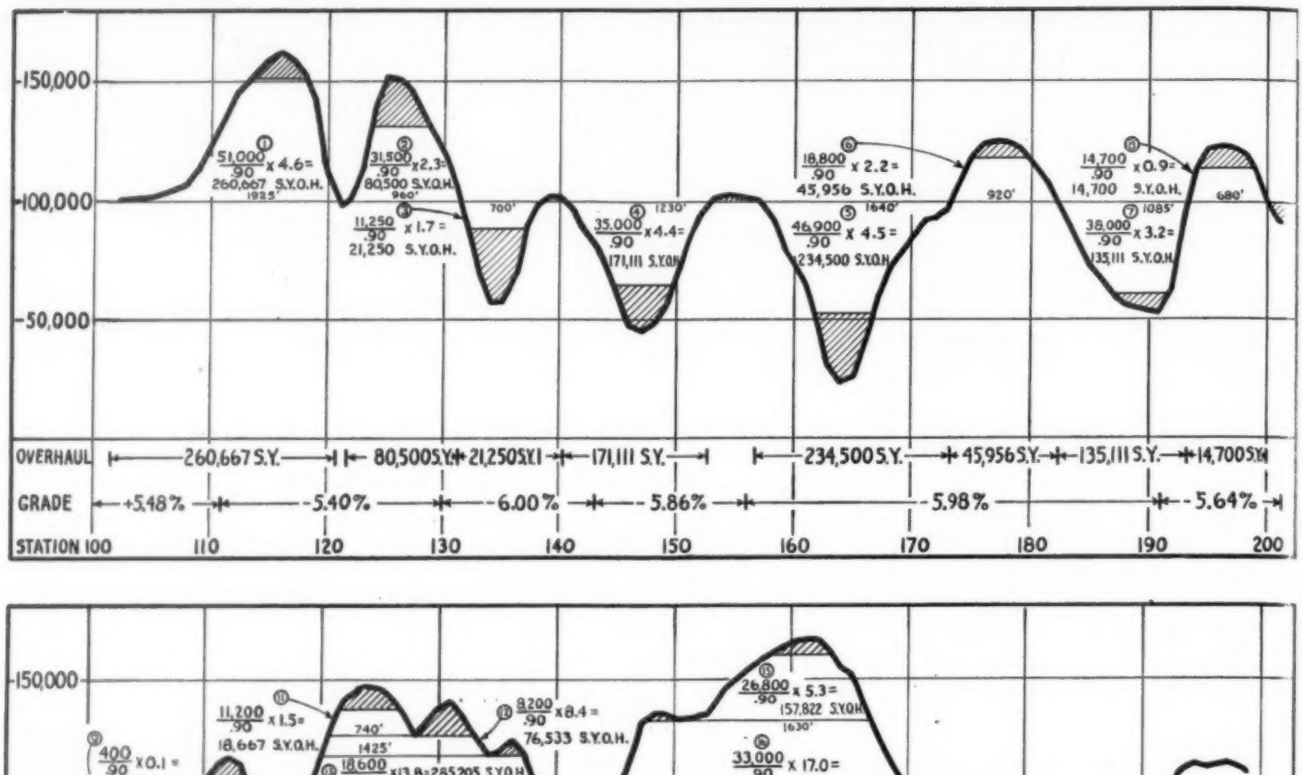
★ Gravel is loaded to grizzly-roofed Euclid rock trucks for delivery to the feeding hopper, using a Lorain crane with 2-yd. Esco dragline bucket



★ Both direct belt power for the crushers and 220-v. electric power for conveyor belts and screens were delivered by this Murphy diesel engine driven generator unit. Note generator in elevated position at far end, connected to engine shaft by belt. Fuel tank at left

★ One of 16 Ford trucks used for delivery of processed materials

★ Another view of the shuttle trucks, showing how grizzly is bolted on the truck body



★ Mass diagram details "heavy" job! Free haul 500 ft. horiz-grid interval represents 1,000 ft., vertical interval 50,000 cu. yd.

newly-purchased 230-ton-per-hour crushing and screening plant, set up along a stream 4 miles dead haul beyond the north end of the job. Pit material is loaded by a Lorain 2-yd. dragline into two Euclid 12-yd. rock trucks for the short haul to the feeder. A feature is the use of grizzly bars with 6-in. spacing, bolted in roof formation over the body of each truck. (See photo captions for details of this plant.

Summary of Numbers Shown in Circle on Mass Diagrams

(1)	260,667	S.Y.O.H.	(10)	667	S.Y.O.H.
(2)	80,500	"	(11)	18,667	"
(3)	21,250	"	(12)	76,533	"
(4)	171,111	"	(13)	285,205	"
(5)	234,500	"	(14)	778	"
(6)	45,956	"	(15)	157,822	"
(7)	135,111	"	(16)	623,339	"
(8)	14,700	"	(17)	226,660	"
(9)	44				
	963,839	"		1,389,611	"
Total—	963,839	S.Y.O.H.			
Total—	1,389,611	"			
Combined Total—	2,353,450	"			

★ Blade operators trimmed the slopes, which were left in practically finished form as the scrapers worked down

An outstanding feature of the US 99 projects is that no detours are available and traffic has to be maintained at all times through the work. Special contract provisions require that the full width existing pavement be kept available to traffic "as long as possible," and that two lanes must be maintained at all times. This requirement, plus the close proximity of the equipment to passing vehicles, has slowed the job, a circumstance anticipated by the contractor. Flag-

(Continued on next page)

Action Programs

Adopted at Highway Transportation Congress

AN action program to carry forward the keynote "Better Highway Transportation for Better Living" was adopted by highway user groups assembled in the Second Highway Transportation Congress held in Washington, D.C., May 6 and 7. Reports of the committees on highway finance and administration (planning), highway barriers and highway safety were considered and recommended to the board of governors of the National Highway Users Conference in the plenary session of the Congress on May 7. Highlights of the recommendations are as follows:

Finance and Administration

A statement of the basic principles and procedures on highway planning was adopted calling for continuing official highway study and advisory boards in the several states, with organized highway user representation, to prepare long-range highway programs based on a sound and realistic approach. In reaffirming previously adopted policies on highway taxation and finance, the report called for adoption of anti-diversion constitutional amendments to safeguard highway revenues, elimination of dispersion and other fiscal and administrative abuses, a campaign for recoupment of monies previously diverted to non-highway purposes and continuing opposition to toll roads. Existing policies on Federal aid for highways, and for repeal of the Federal automotive excise taxes, were reaffirmed and strengthened to call for amendment of Federal highway legislation to deny Federal aid to states diverting any highway user taxes and to preclude existence of toll roads on the Federal aid system. Also adopted was a resolution calling for ear-marking of Federal aid funds for improvement of the 40,000-mile Interstate Highway System.

Highway Barriers

Broadening of reciprocity through complete reciprocal agreements between the states concerning motor vehicles and movement of interstate commerce, as defined by the Interstate Commerce Act was urged, so that motor vehicles should be free to travel in all states subject to the requirement of registration in their state of domicile. With respect to sizes and weights, the report recommended liberalization of many existing limitations; with the AASHO, size and weight standards to be considered as minimum values below which no state should legislate, but above which any state could legislate insofar as its highway conditions and economic needs justify. The report also recommended legislation authorizing the operation of vehicles 102 in. wide on routes where the highway surface is 20 ft. or more wide, with the requirement of express permission of state authorities for operation on highway segments of less width, minimum height limitation of 13½ ft., greater attention by highway study committees to future trends in motor vehicle sizes and weights as well as more consideration to the full utilization of existing highways.

The definition of the word "resident" for purposes of reciprocity and the "PAR" size and weight standards for fuller utilization of highway capacity, were referred to special committees of the National Highway Users Conference for further study.

Highway Safety

Intensified highway user support for the Action Program of the President's Highway Safety Conference was called for to reduce the highway accident toll. Specific proposals include support for the holding of annual state and city traffic safety conferences, state and city participation in national traffic safety and pedestrian protection contests, effective administration of traffic accident prevention techniques and uniform traffic laws and ordinances. The report also called attention to the increasing burden on highway transportation through the rapid increase in insurance rates.

The Congress was attended by approximately 500 representatives of highway user groups from 40 states and the District of Columbia.

(Continued from opposite page)
men are posted at a dozen or more points along the work. In some cases traffic is being diverted to a temporary surface on the new roadbed.

Acknowledgments

H. J. Yount, job manager, and Glen McAfee, project superintendent, are representing Winston Bros. Company of Los Angeles on the foregoing projects. Fred Reed represents the State on the northerly section and R. M. Cooley is resident engineer on the southerly contract under construction engineer C. P. Montgomery. F. B. Cressy is assistant district engineer of construction for the California division of highways district VII (Los Angeles) of which S. V. Cortelyou, assistant state highway engineer, is administrative head and P. O. Harding and A. D. Griffin are district engineers, respectively, for operation and administration.

Winston's Main Equipment Items

- 3 2½-yd. Northwest shovels
- 14 12-yd. Euclid rock trucks
- 25 D8 Caterpillar tractors
- 3 D7 Caterpillar tractors (rollers, pit)
- 12 LeTourneau scrapers (WS 21-yd. or FP 15-yd.)
- 1 Wooldridge scraper
- 3 Tournapuls
- 5 Double-drum sheepsfoot rollers (4-ft. drum, 300 psi.)
- 3 No. 12 Caterpillar graders
- 4 2500-gal. 10-tired sprinkler trucks (Diamond T)
- 2 Huber 10-ton 3-wheel steel rollers
- 2 Pneumatic rollers
- 16 Ford dump trucks
- 1 Lorain dragline with 2-yd. Esco bucket
- 1 1-yd. Lorain truck crane with McCaffrey clam
- 5 365 cfs. compressors (2 Sullivan, 2 Chicago Pneumatic, 1 Gardner-Denver)
- 3 Ingersoll-Rand wagon drills
- Numerous I-R jackhammers
- 4 Chrysler high-lift water pumps, 350 gpm. at 400 ft. head
- 8 miles (approx.) 6-in. steel water pipe
- 6 35,0000-gal. water storage tanks
- Several hose lines with fire nozzles
- VE 46 Pioneer portable crushing plant
- 4,000-lb. Standard hot-mix plant
- 2 Barber-Greene finishers
- Misc. welding trucks, grease truck (Alemite), pick-ups, etc., etc.

This is the first of two articles describing the spectacular road realignment on U.S. 99 north of Los Angeles. The second article, picturing the Clyde Wood Construction Co. project adjoining the Winston work, will appear in an early issue of Roads and Streets.

EDITORIAL

★ Increasing Highway Construction and Rising Costs

The *Monthly Labor Review* gives estimated expenditures for public works each month. One of the most significant facts during the 9 months ending in March, 1948, is that it shows a 50% increase for highway construction over the corresponding 9 months a year earlier.

The sudden ending of the war in August, 1945, caught the engineering departments of states, counties and cities unprepared to launch a normal program of construction in 1946. Moreover many bids were unwisely rejected in 1946 because they seemed too high.

Average weekly earnings in all the building trades were $30.60 in 1940 as compared with $56.50 in January, 1947, and $62.30 in January, 1948. This 10% wage increase in 1947 surprised many engineers who may be even more surprised by the increase in 1948. It is my opinion that construction wages will rise about 10% annually for several years. This opinion is based on the fact that in the century preceding the last war average wages always increased eventually about the same percentage as the increase of per capita currency. In 1939 per capita currency was $54, whereas now it is $192, or about 3.5 times as much.

The *Monthly Labor Review* shows that expenditures for water and sewage works in 1947 were double those in 1940, whereas those for highways had increased only 38%. To keep pace with the rise in wages, highway expenditures in 1947 would have almost doubled, had the same volume of work been done in 1947 as in 1940.

Although highway expenditures are still increasing as compared with the same months of 1947, they have a long way to go before we shall be back to the prewar volume measured in construction units instead of dollars. It is becoming evident that unless gasoline taxes are greatly increased, we shall not attain even that goal, to say nothing of keeping abreast of economic and safety requirements of the growing traffic.

Long experience has shown that the best "toll" for the use of adequate highways is the gasoline tax. As construction and maintenance wages rise, that toll should also rise. Moreover, not a dollar of it should be spent for anything but highway purposes.

—Halbert P. Gillette

★ Transportation Congress

Highway engineering and administrative leaders, individually and as members of national bodies, should be glad that there is a strong, united representation of highway users in this country. The Second Highway Transportation Congress, held in Washington, D. C., last month, was notable for the large attendance and the importance of speakers and delegates in their respective lines of work.

Like many who are currently engaged in administrative and legislative effort in behalf of national highway development, we can go along with some but not all of the individual proposals advanced at this Congress. For example, a resolution was passed calling for the earmarking of Federal-Aid funds for improvement of the 40,000 mile interstate highway system. We believe that earmarkings for special purposes of this kind should be kept to a minimum, and that the principle of investing funds where traffic needs it most must be given a bright go sign. The very foundation of the wonderful work currently being done in analyzing highway needs, state by state, is that of determining the need on an engineering basis rather than on an arbitrary basis. Only facts as found in a thorough engineering survey will show what priority of highway development is best for a given state and its respective communities. The answer may be to concentrate on interstate routes, or it may not.

★ Engineers and Better Equipment

Highway equipment has evolved by fits and starts. Sometimes fundamental ideas have come from contractors, sometimes from manufacturers' research men, less often from engineers. Engineers are more preoccupied with blueprinting the end results. Usually, that is. Here and there, highway department leaders are taking an active and systematic hand in fostering improvements in equipment, feeling that it is part of their duty in their quest for better roads for the highway dollar.

An outstanding example of leadership in equipment matters, we think, is to be found in the California division of highways. Top California personnel concerned with construction and maintenance practices are taking a positive hand in this business, as seen by their deportment at the recent soils and equipment conference, held in San Francisco under Highway Research Board and American Road Builders' Association sponsorship. At this meeting, the engineers showed that they are keenly aware of equipment shortcomings, and that they have their feet on the ground equipment-wise. (See report elsewhere in this issue.) Some of the remarks which they made were pointedly critical. At other times they gave praise where due. In their dealings with equipment manufacturers, the California men have

shown a keen insight on equipment needs a sincerity of purpose and an open-mindedness which have won the friendly confidence of equipment people as well as contractors.

A case in point is the state's decision, right after the war, to require automatic batching equipment on concrete highway work. The contractors kicked at first, but now are said to be generally sold on the move. One leading equipment manufacturing executive has publicly praised the highway division for taking a courageous stand for a new procedure in the interest of better roadbuilding.

California's state highway maintenance and materials men are also doing something definite in their own way on equipment they feel will contribute to a better job. It is understood that experimental models, made in the highway shop, are being tried out for certain tasks where satisfactory labor-saving equipment is not available. This equipment includes machines for securing soil samples and for speeding up pavement joint cleaning and sealing, and other repair work.

Inventiveness on equipment problems is quite common in the maintenance end of state highway departments. But a positive look-ahead policy on contractor equipment, involving frank and friendly cooperation with manufacturers, exists in all too few highway departments.

★ Look to your Trucks

One of the first things a contractor considers when he sits down to figure a job is his hauling, but we doubt if even the contractor boss man himself realizes how big a factor truck management is on the average highway job today. Picking the right size, right type, and right combination, calls for ripe judgment. And the smart fellows are getting good trucks and getting rid of their wartime junkers fast, if they haven't done so long ago. Good drivers and good maintenance and good truck management are mighty important these days.

As a case in point, a job story in this issue, on a 19-mile resurfacing project in Wyoming, includes the amazing statement that hauling of crushed gravel mounted up to over two million ton-miles. Equivalent to ten load trips around the world with an 8-ton truck, and 10 return trips empty!

Survey Hits Oklahoma Toll Road Project

Oklahoma's Turnpike Commission will make another survey of possible construction costs of the proposed Oklahoma City-Tulsa toll road, following a disappointing report by a New York engineering firm on the road's possible revenues. This firm's traffic survey showed that revenue sufficient to finance only a $25 or $30 million highway was likely to be earned by the road, whereas the highway has been expected to cost at least $40 million. Incidentally, this is one of the projects that would be hit by the proposed Congressional ban on toll roads as parts of the Federal-aid system. If the toll road is dropped, Tulsa and Oklahoma City could eventually be linked by a first-class free road on the Interstate Highway System, financed in part by the Federal Aid funds.

Bridge Award Jury

Edward W. Wendell, Deputy Chief Engineer, New York, has been selected for the Jury of Award in connection with the Annual Bridge Design Competition which will be judged tonight in the New York office of the American Institute of Steel Construction. Entries for this highly competitive event are submitted by engineering and architectural students throughout the nation.

Members of the jury are: Edward W. Wendell, deputy chief engineer, New York department of public works; Raymond Archibald, formerly chief of the Bridge Division of the U. S. public roads administration; Morris Goodkind, bridge engineer, New Jersey state highway department; Aymar Embury II, consulting architect of New York City; and Shortridge Hardesty, consulting engineer, also of New York City.

"JUST AIM ME AT SOLDIER'S FIELD, CHICAGO FOR THE GREATEST SHOW ON EARTH — EARTH-MOVING and ROAD BUILDING EQUIPMENT, THAT IS —"

★ Broken pavement areas were broken up by a power outfit for removal

Pennsylvania's Resurface Practice

. . . exemplified on Route 22 force account project involving concrete patching, subsealing, bituminous resurfacing and shoulder construction

By Warren K. Myers

Chief Maintenance Engineer
Pennsylvania Department of Highways
Harrisburg, Pennsylvania

RESURFACING methods being used today to restore war-worn roads in Pennsylvania are well illustrated by the following account of improvements on U.S. 22 near Harrisburg. This route was paved in 1930 with concrete 20 ft. by 9"-7"-9". It served traffic very well until 1941 when the completion of the Pennsylvania Turnpike to the West brought more and heavier loads. During World War II the Third Armored Division moved into Indiantown Gap and Pennsylvania's manufacturing industries hauled tons of materials to the seaboard. Route 22 took a beating.

★ Subsealing crew—showing equipment and protection used against splashing of hot oil. This material was heated to 375° F. and severe burns would result if any of the material came in direct contact with the body

Temporary emergency repairs kept the road passable till the spring of 1947, when driving became hazardous. The subbase failed, voids under the pavement became evident, joints began to pump, and actual pavement break-up had started.

Action was necessary immediately as the plans for complete replacement had not been drawn and the section not programmed for another five years. After a complete survey of the damaged highway it was decided to make repairs to a 11.6-mile section by department forces.

The disintegrated concrete was scheduled to be removed and replaced. The voids underneath the balance of the pavement were to be filled with asphaltic material and the entire project covered with bituminous concrete. Shoulders were to be rebuilt and widened.

It was hoped that this type of repair would eliminate the pumping action and stop the destruction of the balance of the pavement and build sufficient stability in the present road

to extend its life another ten years, which would more than justify the expenditures.

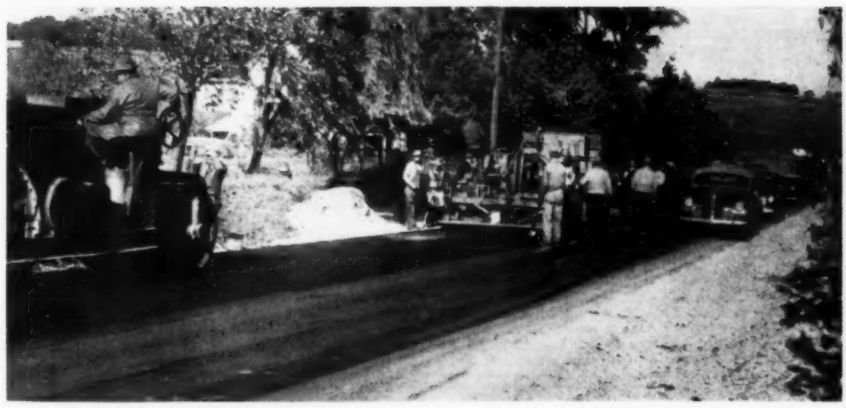
Patching and Subsealing

The first work attempted during the 1947 season was the removal of the disintegrated pavement. This was accomplished by the following crew of men and equipment: 1 foreman, 10 to 18 laborers, 1 pavement breaker, 1 compressor and 1 truck. With this crew 45 days were required to remove the broken concrete. A total of 1928.5 sq. yd. were removed at a cost of $8,995.36, or $4.67 per sq. yd.

After the old concrete had been removed a new patch 10 in. thick was placed in accordance with Pennsylvania patching specifications. This specification, calling for a 1:1½:2.5 mix with 4½ gal. maximum water, gave a high early strength concrete which permitted proceeding with the resurfacing and opening to traffic in 72 hours. Ready-mixed concrete was hauled 7 miles. Material cost $14.50 per cu. yd. delivered on the project. 1928.5 sq. yd. were placed at a cost of $10,488, or $5.49 per sq. yd.

Subsealing

All evidence showed that a great many voids existed in the sub-base and that it was necessary to correct this failure before any degree of permanency could be assured. To correct this failure, a 30-45 penetration blown asphalt cement meeting Pennsylvania specification BF-1 was used. Holes in the pavement were drilled and followed generally the pattern as indicated in the accompanying sketch.



★ Resurfacing with hot-mix followed conventional methods

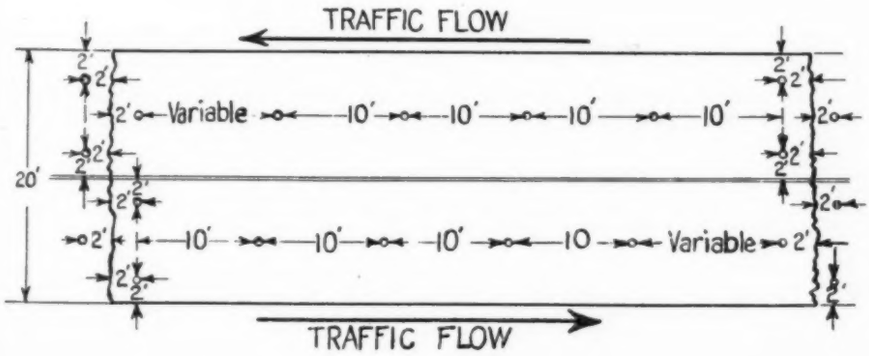
Altogether, 6,394 holes were drilled at a cost of $1,427.34, or average cost per hole $0.223. Then holes and voids were filled with bituminous material hauled about 18 miles. 111,586 gal. was used, averaging 17.4 gal. per hole. Bituminous material cost $.12 per gal. on the job. In this operation 79,477 sq. yd. of pavement was subsealed at a cost of $15,722, or an average of 20 cents per sq. yd.

Surface Procedure

A 3-in. course, consisting of two layers of hot-mixed bituminous concrete resurface was laid under Pennsylvania specification ID-2. Base course material averaged 200 lb. per sq. yd. and surface course material averaged 116 lb. per sq. yd. Bituminous material was hauled about 18 miles; cost $7.85 per ton delivered on the job. 90,253 sq. yd. was placed at a total cost of $130,296, or a sq. yd. cost of $1.44.

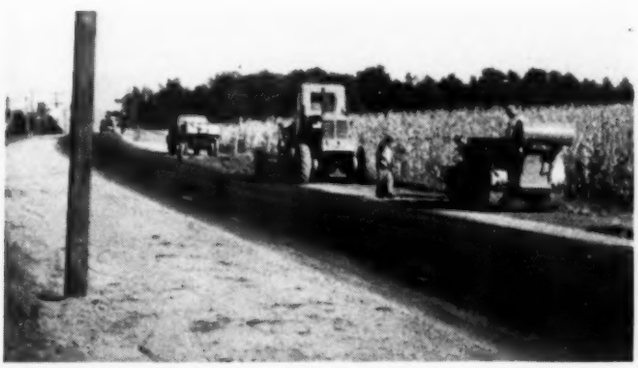
The binder material was placed with a 2-in. compressed thickness except where curves were elevated. All curves were superelevated in accordance with department standards, and 261 tons of material was used for this purpose.

The surface course, 1 in. of compressed top bituminous material, was completed in 47 days, with 14,490 tons of material placed, using a mechanical spreader. Daily average, 308 tons. First rolling was done with an 8-ton tandem roller, and final rolling with a 10-ton, 3-wheel roller.



Shoulders Rebuilt

The shoulders were rebuilt on the entire project, at widths varying from 6 to 10 ft. and averaging about 8 ft. All shoulder material was borrow, obtained from a pit near the center of the job. Shoulder material was hauled four miles. Royalty $.05 a cu. yd. A total of 12,737 cu. yd. was hauled and placed in 43 days, or 296 cu. yd. per day. Royalty, removal and delivery of this material cost $11,237.74, or $.89 per cu. yd.



★ Final rolling of the surface course, using a 3-wheel 10-ton roller. Right: How shoulders were improved

Cost Summary

1.	Removing disintegrated concrete	$4.67 sq. yd.	$ 8,995.36
2.	Placing concrete patch	5.49 " "	10,488.00
3.	Subsealing	.20 " "	15,722.00
4.	Placing Pennsyl. Spec. ID-2 bituminous material	1.44 " "	130,296.00
5.	Rebuilding shoulders	.56 lin. ft.	21,256.11
6.	Traffic control and misc.		5,801.68
		Total	$192,559.15
	Cost per mile of roadway		$ 26,670.24

Supervision, Labor and Equipment Rates Per Hour

Foreman	$1.15
Caretaker	1.00
Skilled Labor	.95
Common Labor	.85
Tractor Drill, includes fuel and operator	2.75
Compressor	1.75
Pick-up-truck	.35
Shovel	5.00
Trucks	2.25, 2.50, 3.50, 5.00
Roller	2.90
1½-ton Truck	1.95
Bit. Spreader	5.00

The shoulder material was leveled with a power grader and rolled with a 3-wheel, 10-ton roller. Two laborers filled in low spots that developed and the foreman dumped the trucks. In addition to this operation, five to eight men were required to fill in by hand the shoulders next to the pavement so that it would be protected when traffic was allowed to use it.

Traffic was maintained during the construction, one-way traffic control being established and handled by flagmen. Since there is a large volume of vehicles on this route it necessarily caused delay and extra expense.

Big Equipment Fleet Moves 250,000 Yds. in 48 Hours

150 machines unite on recreation project in Peoria as a demonstration of what modern earth-moving equipment can do

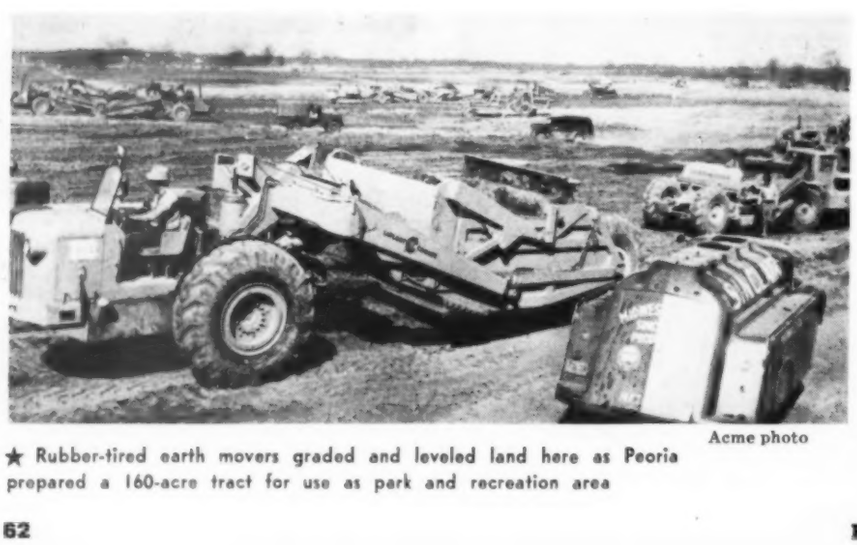
BELIEVE it or not a fleet of earth-moving equipment, working around the clock for two days, averaged 5,208 cu. yd. per hour on a land leveling job.

The scene was Peoria, Illinois. The time, April 24 and 25, 1948. The task was the leveling of approximately 160 acres of land for the Exposition Gardens in Peoria, a civic enterprise. Here was a case where everyone pitched in and donated services for the community good. Under the direction of Lt. General R. A. Wheeler, Chief of Engineers, U.S. Army, nearly $100,000 worth of work was knocked out in record time. Thanks is due to many contractors in the area who donated the use of their equipment without charge, to labor unions which arrange for the donation of services of machine operators and servicemen without charge, and to the help of many others. Oil companies donated the fuel and lubricants. Local business houses donated the meals eaten by the operators and servicemen. Machinery dealers in the area lent their service trucks and servicemen to keep machines operating constantly. Power for illumination was provided by diesel electric generator sets, also donated for this use by manufacturers or dealers.

The whole job was done in about 40½-hours elapsed time, or even less than the 48 homes scheduled. On the project, milling around in a tremendous show of modern power, were several makes of tractors of various ages and in various stages of conditions from new to not so new. Also, several types of scrapers, motor graders and other equipment.

At least 100 contractors from surrounding states, even as far away as Pennsylvania, came to watch the show. Manufacturers of equipment used have issued statements regarding the performance of their individual machine, and it is understood that the yardage produced here constitutes a preview of what contractors can expect with some of the latest models.

Not only did all machines work continuously, stopping only for oiling and greasing, but they did so in very difficult working conditions. Once the topsoil was removed, a very heavy clay was encountered, which proved a serious problem to some of the equipment. The project performance was also the result of careful advanced planning. The work was carefully surveyed, and the area divided into working sections for the different machines.



Acme photo

★ Rubber-tired earth movers graded and leveled land here as Peoria prepared a 160-acre tract for use as park and recreation area

Massachusetts Toll Road Study Recommended

Another Eastern toll road is being considered. Massachusetts' Committee on Highways and Motor Vehicles has asked that $300,000 be appropriated to survey feasibility of constructing a toll road from the Connecticut line to the New Hampshire line, and from a point west of the Connecticut River to Boston. The toll road epidemic, slowed down by last year's state legislatures, appears to be flaring up with new energy, despite almost unanimous opposition of highway user groups. The Massachusetts proposal is but one expected to get consideration. Other Bay State needs, if the study committee's recommendations are heeded, would be met by a 20-year bond issue, to be retired through revenue collected from the present three-cent gas tax.

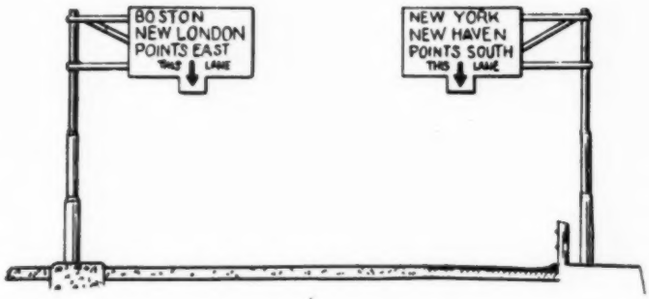
See You in Chicago!

Connecticut Adopts Illuminated Overhead Signs

DEPARTING from its standard for directional signs on expressways, the Connecticut state highway department plans to erect new overhead signs on the westerly approaches to the Charter Oak Bridge. Five distinct types of assembly will be used, the location of each assembly determining the choice. The signs will be placed on the South Meadows Expressway, the Conland Highway and the traffic interchanges west of the bridge.

It has been recognized by the department's traffic engineers that traffic congestion and accidents at intersections are abetted by lack of directional signs which are legible both day and night. This lack is also an annoyance to motorists who are unfamiliar with the route upon which they happen to be.

It is also realized that the maximum benefit from directional signs on expressways can only be obtained when the signs are placed so as to be visible within the vehicle operator's cone of clearest sight. The extent of this cone is only approximately 2½ degrees on each side of a straight line of vision. At high speeds the operator aims rather than steers his vehicle, focusing his eyes on a point well in advance of his immediate position. The faster the speed, the less recognizable are objects outside of the lines of the driver's clearest sight cone.



In an effort to meet this condition and as a means of bringing sight and signs more into line, the engineers believe that illuminated, conspicuously-lettered, overhead signs are a step in the right direction. By increasing visibility distance, driver's will be aided in predetermining the proper traffic lane they should occupy, and, when necesary, be afforded adequate time to make a lateral maneuver before reaching an intersection.

The signs to be erected on the Charter Bridge approaches will be mounted to provide 14 ft. of clear height above the pavement surface and will be inscribed with letters 15 to 18 in. high. They will be illuminated for night reading.

The development and design of the new signs was carried out in the State's traffic engineering section of the division of highway control.

●

British Miners Ban Inventors

By Halbert P. Gillette

NOT many months ago John Lewis said that the American miner produced four times as much coal annually as the British miner, and was therefore entitled to the much greater wages that he was receiving. What Lewis failed to add was that for more than a generation his union miners opposed the introduction of the powered machinery that has so greatly increased their output. It was competition of the non-union miners equipped with such machines that finally brought Lewis to his senses.

In Britain no such competition has existed, and the coal miners remain as inefficient as ever, and as poorly paid. Their inefficiency was recently headlined in newspapers by abstracts from a report by T. E. B. Young, a British mining engineer who has just returned home from a tour through American coal mining regions.

Young found that the average daily output of American coal-face workers was 6.4 tons of 2,240 lbs. as compared with 2.9 tons for the British miner. The averages for all coal mine workers, both underground and on the surface, were 4.6 tons in America and 1.07 in Britain, or a ratio of 4.3 to 1. The American coal miner averaged $15 a shift; the British miner, $5.60.

Young reported that the only immediate remedy is harder work. Doubtless he also reported that the ultimate remedy is the introduction of American coal mining and hauling machinery; for harder work can't begin to close the gap between 1.07 and 4.6 tons per man.

A good many years ago when I was writing my book on Rock Excavation, Mr. Saunders, then President of the Ingersoll-Rand Drill Co., told me a tale that should have had newspaper headlines, not only here but in Britain. A year previously he had sent a rock-channeling machine with operators to demonstrate its economy to all quarry owners in Britain who might profitably use the machine. After spending a year there, his salesman had returned without having sold a single channeler. The reason was that no quarry owner dared buy a machine without the approval of the union, and that was not obtainable.

Evidently British coal mine unions have been equally foolish; and since there was no competition to force them to abandon their folly, they still cling to the old delusion that jobs are created by refusing to substitute mechanical power for muscle.

British socialism is the direct consequence of British labor unionsm. Having prevented the owners of plants from installing the latest labor-saving devices, the union leaders attribute relatively low wages to the "greed of capitalists" instead of their own stupidity. During the war and subsequently income taxes have been so high that no funds were available for modernizing plants even when the unions did not oppose modernization. Finally the British went socialistic, in the vain hope that what private enterprise could not accomplish in the face of labor "featherbedding," politicians might accomplish by persuasive oratory.

The end of this British folly is, I believe, not far off.

●

State Gas Tax Receipts Increase—State motor-fuel tax collections and other receipts, such as inspection fees, dealers' license fees, fines and penalties, amounted to $1,206,901,000 in 1947, as compared with a total of $1,064,681,000 in 1946.

Electrical Stabilization of Soil

By E. S. Barber
Consultant in Soil Mechanics, Arlington, Va.

ELECTRICITY may be used to stabilize soil in various ways such as heating, drainage, and to introduce chemicals into the soil pores.

Either direct current or alternating current may be used to dry the soil by the heat which develops when a strong current is passed through the soil. The use of this method has been reported for making a fused pavement (1)[1] and for drying clay to the point where its attraction for water is destroyed. (2) The more general applications depend on the electrokinetic phenomena shown in Fig. 1, which require a direct current and do not depend primarily on heating.

Theory Involved

When soil and water are mixed, the soil takes on a negative charge and the water a positive charge. If a voltage is applied between two electrodes in the mixture, the soil is attracted by the positive electrode (anode) and the water is attracted by the negative electrode (cathode). When the soil particles are closely packed so that they cannot move, the water moves to the cathode producing electro-osmosis. While electrophoresis is not directly applicable to soil stabilization, studies of its use in ceramics (3) may aid in understanding electro-osmosis since the fundamental theory of the origin of the charges and the relation between rate of flow and applied voltage are the same (4, 5, and 6).

The quantity of water transported, V, is proportional to the time, t, and the cross-sectional area, A; it is inversely proportional to the resistance to flow of water, K; and directly proportional to the force gradient which is the product of the charge, C, and the voltage gradient,

$$\frac{E}{L} \therefore \text{ Thus, } V = \frac{tA}{K}\frac{CE}{L} \quad \text{.....(1)}$$

which is similar to the relation between the normal flow of water and the hydraulic gradient. Substituting the product of resistivity, R, and current, I, for

$$\frac{AE}{L} \text{ gives}$$

$$V = \frac{t}{K} CRI \quad \text{.....(2)}$$

[1]Numbers in parentheses refer to references at end of paper.

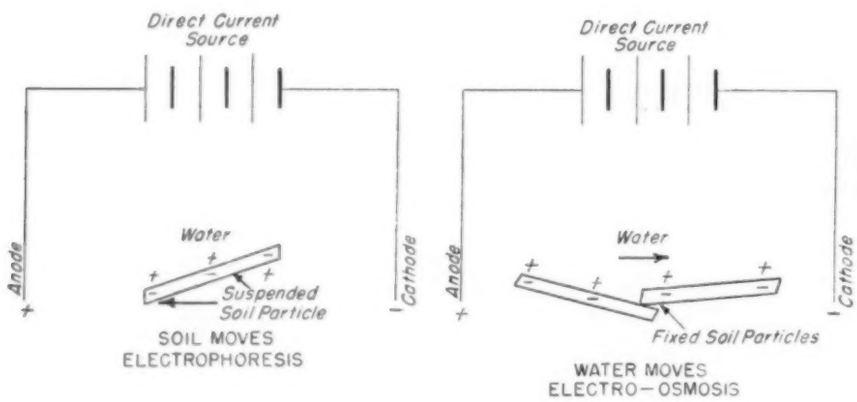


FIGURE 1-ELECTROKINETIC PHENOMENA

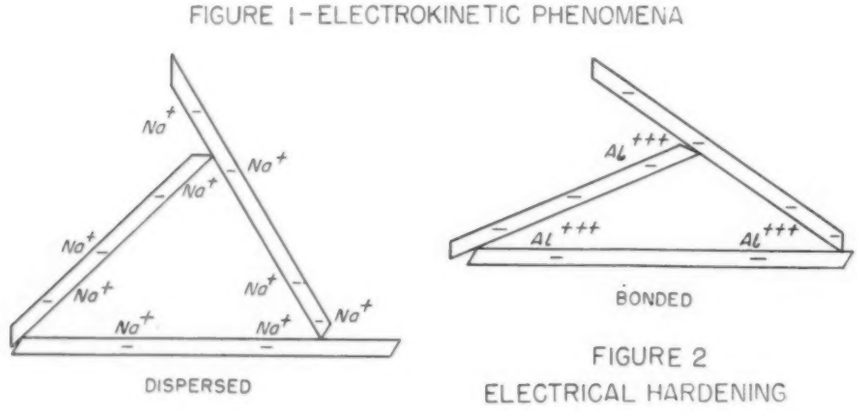


FIGURE 2
ELECTRICAL HARDENING

Equation 2 indicates that the quantity of water is proportional to the quantity of electricity, tI. Laboratory experiments (7) have shown this to be true for low current densities until there is excessive drying at the anode. Current densities above about one ampere per square foot cause appreciable heating which, while less efficient than electro-osmosis, dries the soil by evaporation and increases the flow of water by decreasing its viscosity.

For a circular cylinder of soil between two impervious electrodes the coulombs of electricity (It) required to expel one gram of water was found to equal five times the percentage of clay (smaller than 0.002 mm.) Much smaller quantities of electricity have been required in laboratory tests with pervious cathodes and in field applications.

Drainage

Table 1 shows the increased flow obtained on three projects where conventional well-point systems for temporary drainage during excavation were supplemented by supplying a direct current between the wells, which acted as cathodes, and anodes which were driven between the rows of wells (8). At present, successful application of this method has been limited to silty materials with a mean size between 0.004 and 0.04 mm.

In addition to the temporary stabilization obtained by controlling the flow of water, the soil is consolidated. By supplying a direct current between electrodes in a fill which was constructed with an excess of water, the moisture content was reduced from 24-26% to 14-17%.

If the cathode is impervious, the moisture content nearby is increased by the first flow of current. This principle is used in ceramics to lubricate dies through which clay is extruded (9). It may possibly be used to aid in getting steel piles through stiff clay layers.

Hardening

As more current flows, the soil is consolidated around the cathode as well as by the anode making it possible to increase the bond between piles and the soil by supplying a direct current between two piles. In one instance, 12-inch diameter timber piles covered with sheet aluminum were driven 20 feet into a uniform soft plastic clay and developed a skin friction of 250 lb. per sq. ft. After the application of 110 volts direct current at 25 amperes

for 11 hours (30 kilowatt hours) between two piles, 6 feet apart, the skin friction of both piles was increased to 1,250 lb. per sq. ft. (10).

Application of additional current decreased the friction below the peak value apparently because of the development of shrinkage cracks near the electrodes. When the piles were pulled, there was about an inch of soil attached to the piles. Around the anode the soil contained white deposits and the corroded aluminum blended into the soil.

This phenomena may be pictured as indicated in Figure 2. One cause of the charge set up between the water and the soil is the tendency of the cations (positive ions which move toward the cathode) to "dissolve" in the water more readily than the anions. At top of Figure 2, these cations are pictured as sodium (Na+) which is typical of highly dispersed soils. If aluminum electrodes are placed in the soil and a direct current applied, the sodium cation migrates with the water toward the cathode and is replaced by aluminum cation from the anode which tends to bond the soil particles together, due in part to its higher valence, as indicated at the bottom of Figure 2. The benefit that may be derived by this base exchange depends upon the kind of cations in the original soil and on their replaceability. The introduction of salts may increase the flow of water by decreasing the resistivity (see equation 2); but since they also decrease the charge between soil and water, there is an optimum beyond which the flow is decreased. The hardening of soil by this process including the introduction of salt solutions at the anode was patented by Leo Casagrande (11). His patent also mentions the possibility of depending on the galvanic action of the electrodes to supply the current as in the use of aluminum, magnesium, or zinc anodes for the cathodic protection of metal structures against corrosion (12).

Masses of soil have been stabilized in field tests by the application of from 1 to 6 kilowatt hours per cubic foot using 100 volts between electrodes 3 feet apart (13); however, some soils could not be stabilized by this method. Samples of the stabilized soil had reduced plasticity and did not slake after 2½ years immersion. A similar arrangement using a 30-kilowatt generator and porous anodes has been employed to reduce frost heave by introducing calcium chloride into the soil. It was observed that at the anode the pH decreased (to 3.2) and the permeability increased, while at the cathode the pH increased (to 7.6), and the permeability decreased. When sodium chloride was tried instead of calcium chloride, the soil around the cathode swelled excessively.

Table 1.—Drainage with electro-osmosis

	Wells[1]		Flow per well		Supply of electricty per well	
	Depth	Spacing in line	Gravity alone	Electro-osmosis plus gravity		
	Feet	Feet	Cu. ft./day	Cu. ft./day	Volts	Amps.
Railroad cut	25	33	0.7 av.	105 av.	90	25
U-Boat Pen	66	33	0.8-34	7.7-320	40	20-30
Tunnel approach	40	33	negligible	3.3 av.	30	15

[1]In double lines with anodes in parallel lines.

Conclusions

There are many possible methods of using electricity in stabilizing soil. The practical applications have been limited to special projects where the need for the solution of a problem was more important than the cost which was often high. However, its range of application may be broadened as experience in laboratory and field investigations is accumulated and analyzed.

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11. "Method of Hardening Soil," U. S. Patent No. 2099328, issued to Leo Casagrande, Nov. 16, 1937.
12. "Underground Corrosion," National Bureau of Standards Circular C 450, 1945, p. 262.
13. "Electrical Stabilization of Soil," (Review of two Russian articles) E.N.R., May 15, 1947, pp. 822-3.

Banners for Road Show Shipments

Harvey A. Scribner, Chairman of the Road Show Promotion Committee, has announced that banners will shortly be available for mounting on equipment being shipped both by freight and by truck. These banners bear the inscription, "See Me At The ROAD SHOW, July 16-24th, Soldier Field, Chicago." They are 40 in. x 60 in. in size with white letters on a blue field, in order to provide contrast with the colors generally being used to paint equipment. They come complete with reinforcements and tie ropes. These will be furnished without charge to those companies shipping equipment to the Road Show.

Steers Wins Moles' Vote

J. Rich Steers, Jr., president of the 44-year-old New York contracting firm that bears his name, now rebuilding war-damaged harbors in Greece at Salonika, Piraeus and Volos and the Corinth Canal, has been elected president of The Moles, New York society of tunnel and heavy-construction men which he served last year as vice-president.

State Gasoline Taxes Increase 10%

State gasoline taxes were collected on 28,407,000,000 gal. of motor fuel during 1947, an increase of 2,539,000,000 gal. or nearly 10% more than was taxed during 1946, according to figures compiled by the Public Roads Administration of the Federal Works Agency from motor-fuel reports of State agencies. This gallonage does not include approximately 4,345,000,000 gal. of gasoline on which the tax either was not paid or paid at a reduced rate because the fuel was used for Government or non-highway purposes such as agriculture, industry, etc. In all, 32,751,954,000 gal. of motor fuel passed through State taxing channels during 1947 compared to 30,138,041,000 gal. in 1946.

The largest percentage of increase in gasoline consumption, based upon the number of gallons taxed at prevailing rates, was recorded in Wyoming, which reported an increase of 13,969,000 gal. or approximately 15% above the 93,450,000 gal. consumed in 1946.

California again led all states in the amount of motor fuel taxed, with a total of 2,739,906,000 gal. in 1947, an increase of 303,476,000 gal. or 12.5% over the 1946 figure. New York was second with a total of 1,943,409,000 gal. consumed in 1947, an increase of 150,544,000 or 8.4% more than the 1946 total of 1,792,865,000 gal. Pennsylvania was third with a total of 1,801,468,000 gal., an increase of 9%, and Texas fourth, with a total of 1,708,454,000 gal., an increase of 10.5 over the 1946 total.

See You in Chicago!

Paving Equipment Needs

Examined by West Coast Road Men

Continuing an R & S editorial staff report on the Western conference on soils and construction equipment, April 8-9, in San Francisco, held jointly by technical committees of the American Road Builders' Association and the Highway Research Board (See also editorial in this issue)

THE second day of the San Francisco conference noted above was devoted to concrete and asphalt paving equipment. Ben H. Petty, professor of highway engineering, Purdue University, presided over the concrete session; T. E. Stanton, materials and research engineer, California, over the asphalt session. Following notes cover some of the many interesting points of discussion:

Road Forms. There has been a tendency toward lighter weight road forms for two-lane work, noted one manufacturer representative, who urged use of sufficiently strong and heavy forms to insure trueness under heavy finishing equipment. He recommended forms with ¼-in. steel plate as the best investment for road and airport work.

Forms Roughly Handled

Carelessness in staking and locking forms still prevails, to the detriment of pavement smoothness, observed chairman Petty. Forms seen on certain recent jobs were not locked at all. Contractors' men continue to jerk forms loose by imperfect lifting devices, the result being expensive repairs, less satisfactory quality on the job, and early scrapping.

Stabilizing of forms where set over granular base materials was seen to be a widespread problem. New York practice is to use a well-compacted glacial gravel subbase having high stability. Gravel is placed slightly wider than the pavement base, insuring good support to forms. However, pins are difficult to drive. Pins of 18 to 24 in. length are used commonly in New York state for 8 or 9-in. forms. Use of 30 to 36-in. form pins in the middlewest was reported in conjunction with granular blankets placed full roadway width.

The question of specification details on forms was raised, and of just when a stock of old forms is OK. The engineer should see that inspection includes stake pockets, wedges, lock joint plates, and other details. Wedges must be driven to proper position. The locking device is sometimes damaged when driven by a stake sledge instead of tapped with a light hammer.

Concrete Batching Equipment. In discussing this equipment, Bailey Tremper of Washington state said that some equipment still lacks satisfactory weigh box and scales. Scales used to be insisted upon which measure within 2 lb. on the dial, but today there is a preference for specifying accuracy within a percentage of the load.

The 2-lb. tolerance specification is no longer feasible, said a manufacturer's representative, who reminded that for a 20,000-lb. batch a 20-lb. graduation on the dial results in accuracy of 1% which is certainly getting things down fine. He recommended that states change their specifications where necessary to get up to date on this point.

Bulk cement has largely replaced sacked cement in some western states, it was noted. There is still the problem of getting cement into the truck on a windy day.

Automatic Batching

Automatic batching of aggregates is a "hot" subject in California, it seems. R. M. Gillis, assistant state highway engineer, discussed this matter frankly, saying that while contractors at first were against such equipment, it insures bigger, steadier production as well as more uniform concrete. One box cannot dump while the other is empty, with approved automatic equipment. Automatic units in capacities suitable for highway contractors are now well perfected, he said. Today in California automatic equipment is no longer "imposed" on the contractor, but is sought by him as a means of cutting down on labor requirements. Good workers with interest in their work are scarce today, and the contractor feels that he is money ahead with any "operator-proof" equipment he can put on the job.

Requirement of automatic batching equipment is relaxed by the California engineers when the job involves less than 3,000 cu. yd. of material. Also, when ready-mixed concrete of good quality, made with automatic equipment, is available. A rebate is required from the contractor, however, when he is spared the expense of placing automatic equipment on the job.

Portability Desired

One representative of a batch plant manufacturer noted that utmost portability is a highly desired feature of bins and other components. This firm makes an all-welded bin with an integral 100-150 bbl. cement compartment, which knocks down easily for highway hauling.

Quick adjustment for changes in mix design and batch size is also a valuable feature, especially for ready-mix suppliers and contractors who must serve numerous projects. Sometimes 25 to 40 individual mixes are called for in a single day, in which case automatic batching equipment hasn't proved fast enough. Some of the latest automatic equipment, however, can be made to turn out any one of 12 predetermined mixes by making a simple adjustment.

An eastern manufacturer representative complimented the California division of highways for courage in taking the lead on automatic batching, which he said is being more widely accepted nationally for ready-mix as well as highway work. Equipment forced by this step has proved its worth. And design advancement is still to be expected. He also remarked on the difference in custom between western and eastern paving work. In the west, a one-stop plant is more commonly required or provided. In the east, a more common requirement is to carry cement to the paver in a separate water-tight container on the batch truck. He recommends double batchers for aggregate and for cement, working sumultaneously, as a means of saving seconds on each load and speeding up the job. Two double bins are recommended where there are 3 or 4 aggregates, these bins being strung out for stockpiling.

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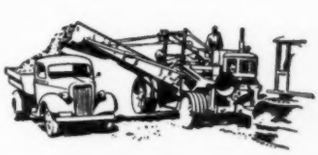

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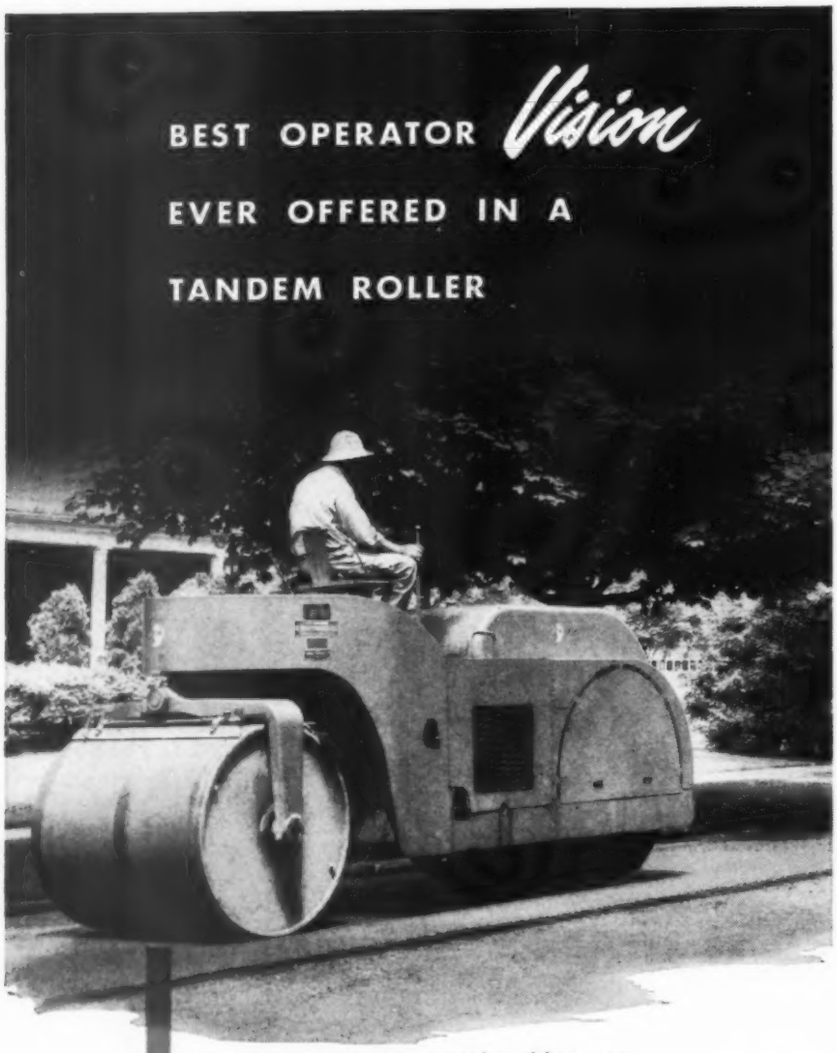

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without difficulty. That's why the new
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Clamshell loading is more prevalent in the east, whereas belt loading is favored in the west, this delegate noted.

Pavers vs. Ready-Mix

Concrete Mixers. Little discussion was aroused on the subject of concrete pavers, which are now so highly developed that critical feeling about them is rare. More and more dual-drum units are in the picture.

Transit mixers proved a livelier subject. Tighter specifications were seen to be needed, aimed at preventing segregation due to careless discharge on the grade. Water control is also of continuing concern to the engineer, since more responsibility is put on the inspector. Transit mix, while popular on street paving, is only a minor factor on highway work except for culverts and small bridges.

Road contractors prefer their own batch plants, too, for faster production and so they can better coordinate their whole operation. Some contractors have their own truck mixers. Ready-mix firms prefer not to tie up their equipment on big long-haul jobs when their need is to keep servicing a lot of smaller customers.

Wider use of air entraining agents is seen to be changing the whole picture with respect to ready-mix vs. pavers. Some California concrete suppliers are seeking permission from the division of highways to use air-entraining concrete for its workability and reduction of segregation.

One eastern manufacturer of a broad equipment line noted that dump-truck haul of concrete has been done with satisfactory results on some jobs, the use of this equipment depending on such factors as haul length, roughness of pavement traversed, etc.

Central mixing, in combination with agitator truck bodies, came in for extensive discussion at the Ready-Mix industry's recent annual convention, and the economics of this subject will bear close watching by both engineer and contractor,

How fast should a paving job be allowed to progress? Contractors should push for top speed within the "specs," in order to cut their costs, but some agencies impose a limit on feet-per-hour progress.

Concrete Spreaders. Makers of spreaders are now concentrating on refinements, including details that will relieve strain and thrust on the forms. Some states continue to specify single-lane pouring, principally with the idea of avoiding overload on forms. Skillful spotting of paver batches is still needed, however, to see that the spreader has to bulldoze a minimum of concrete.

(*Continued on page* 72)

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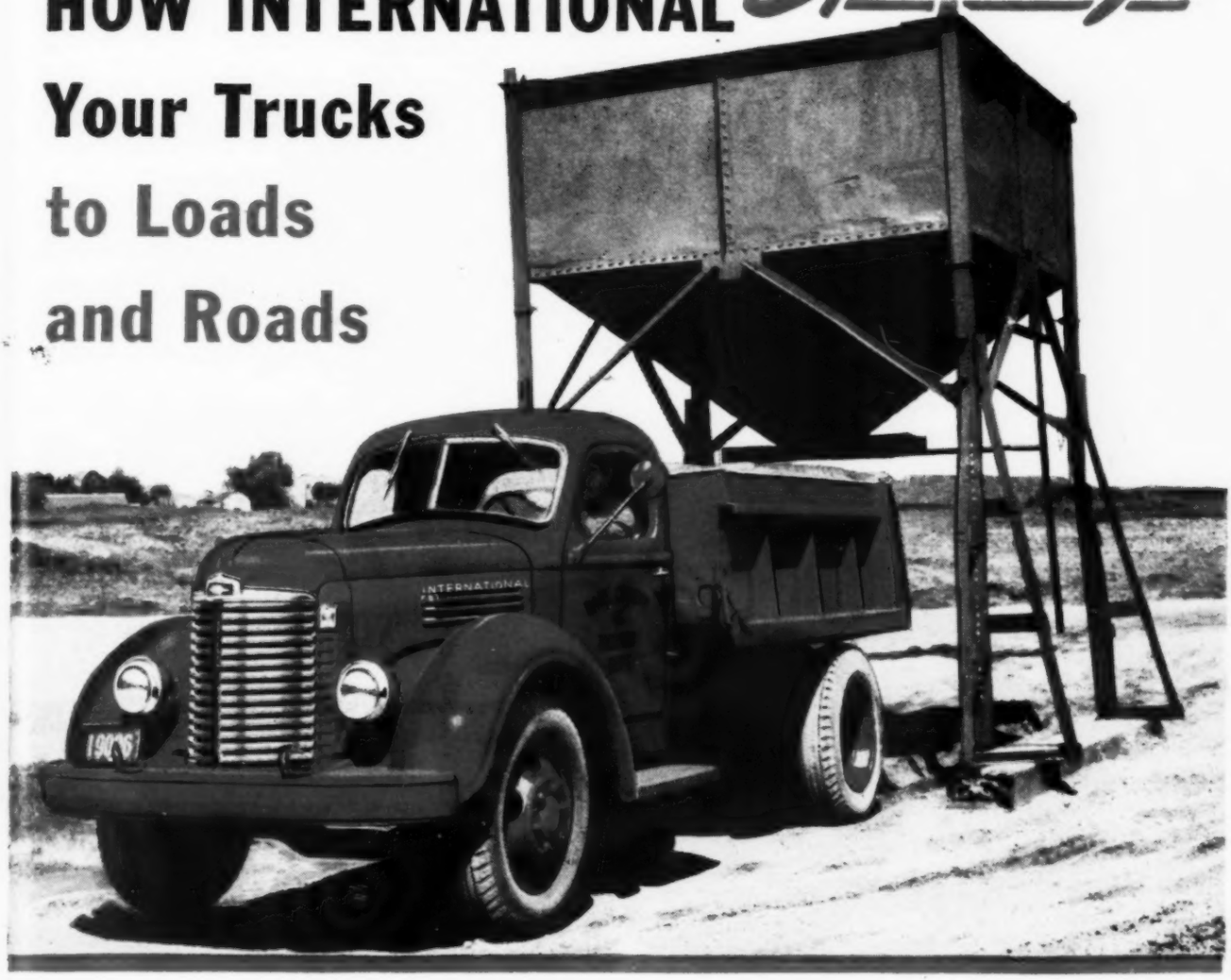

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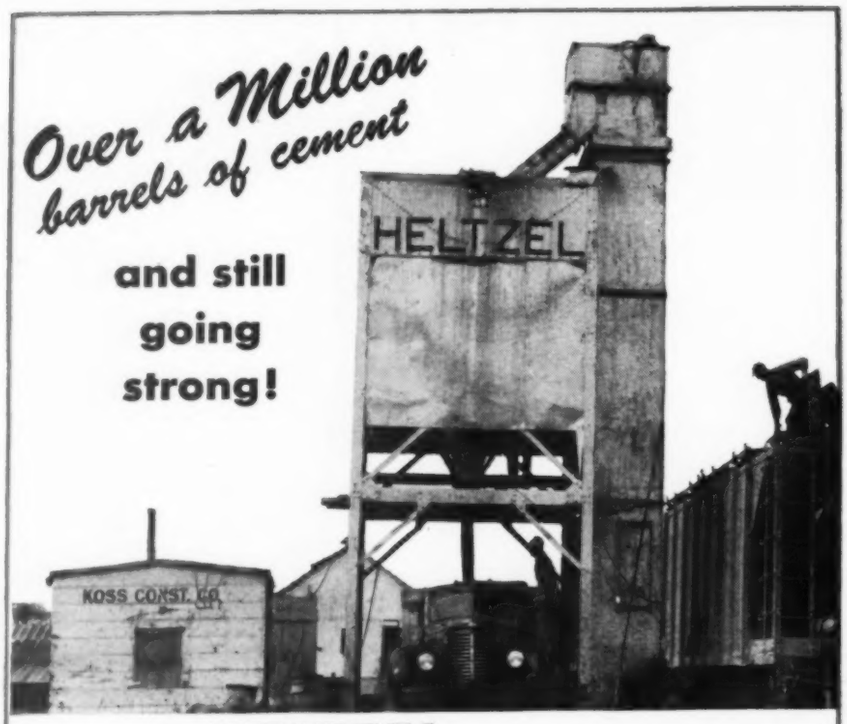
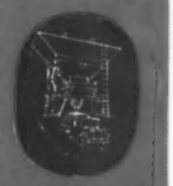


VETERAN **HELTZEL** PLANT HAS REPAID ITS COST 42 TIMES OVER IN 17 YEARS . . .

• 1,160,500 barrels of cement have been unloaded by this plant. In 1931, time studies indicated the plant cost would be repaid at the handling of 25,000 to 30,000 barrels. (Note comments by Mr. Koss in the following letter.)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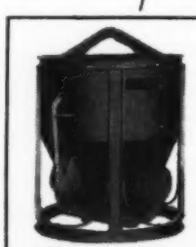
Yours very truly,

RBKim

Richard B. Koss
Vice President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(*Continued from page* 68)

Finishers, apart from spreaders, received little comment. A wider use of the float-type finisher which skims up and down a thousand feet of pavement behind the paver, was noted in California where this type of machine was first developed.

Bituminous Mix Equipment

Plant Mixers. Automatic batching pays even more on bituminous work than on concrete, in the opinion of one California highway leader. Contractors aren't admitting it, but this equipment will work to their benefit. "A 'good' contractor employee on a manually-controlled plant will never let the plant stop just because the bin runs dry," it was remarked.

In California the engineers have gotten away from the old established asphalt concrete mixture and are substituting a 3-bin plant procedure employing paving asphalt—no filler dust or other old-time refinements, and the mix is placed without side forms. Bases are made heavier today, and the black top is considered more of a wearing course than anything else.

All these remarks were preliminary to a discussion by manufacturer representatives of the highly developed and elaborately-controlled mixing plants of today. Plants have had to be designed so that average workers can operate and maintain them, in the face of more strict requirements by the engineers. All asphalt plants need to be designed with more thought as to the inspector's problems. Sampling should be made easier.

Automatic Problems

Automatic batching methods must overcome mix-errors due to water present in the mix, causing foam, and due to cutting off of any one aggregate size. One of the most difficult problems overcome in automatic equipment is the measurement and control of fines. Control of bin level is another inherent problem. A better means of controlling asphalt delivery to the mixer is also wanted, frequent minor changes being a difficulty now controlled better on latest equipment. With volumetric control, measurement of bituminous materials seems to be the critical problem.

One manufacturer is working to perfect a fully electrically-controlled plant, having a clean, protected control room.

Some disagreement was in evidence on the respective merits of the continuous vs. batch-type plant, and no conclusion was reached on this point.

The dryer is the limiting element in plant size, a 72-in. diam. dryer being the largest than can be carried over the highways. (One manufacturer is

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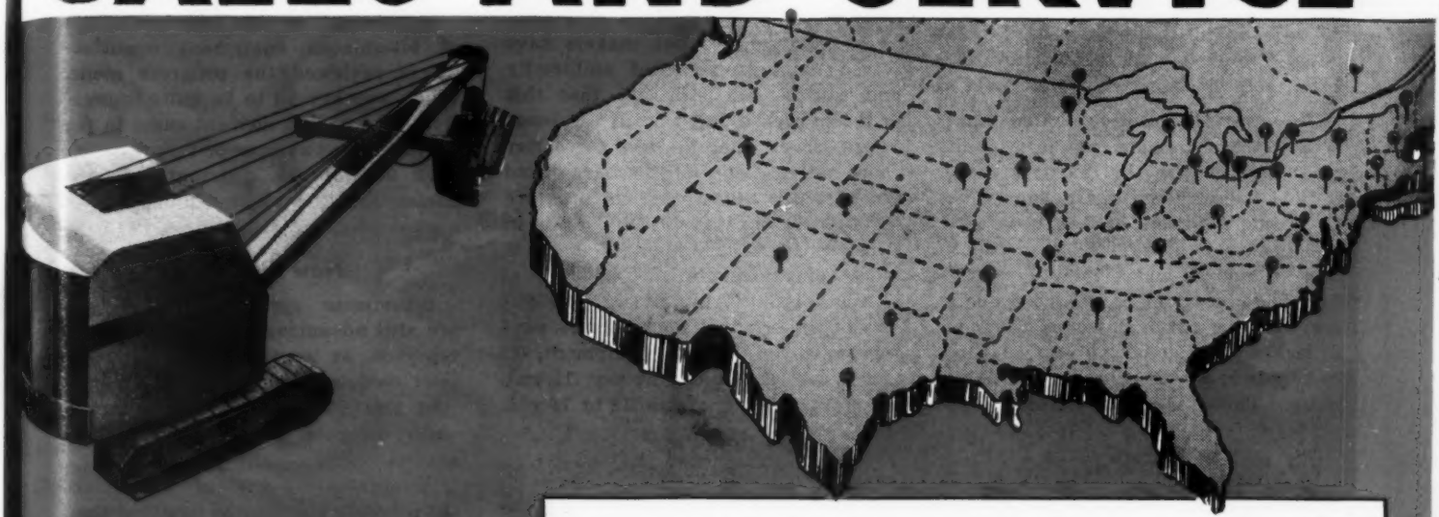

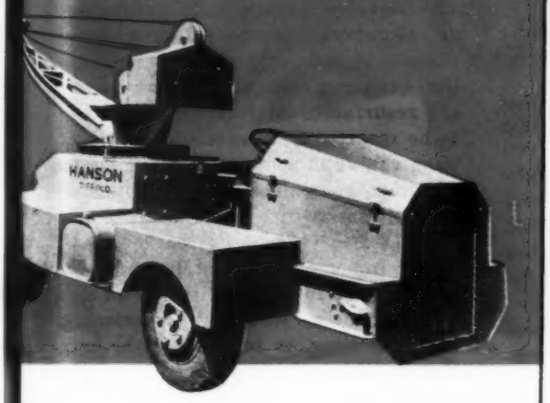

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Control of heat in the pugmill still exists in some equipment in service, although this detail is solved in newest plants. In getting water out of aggregates, heat in the stone may overheat the asphalt in the mill. Asphalt can lose half its penetration in 30 seconds in the pug mill, it was noted. Two dryers via the hot elevator, is one solution being employed.

The over-all question stated was: Will extreme refinements in asphalt plant control give the taxpayer more for his highway revenue dollar? The California division of highways occasionally sets up a "one bin specification" for a job where there is a uniform pit, but some of the engineers are wondering if it is a real economy to risk an occasional bad batch, since bad spots in a pavement mean high repairs. There is little difference in maintenance cost between road-mixed and plant-mixed black top in California, it was said.

Distributor Dissatisfaction

In general there is still no perfect bituminous distributor, said another California spokesman. This engineer, a man of highly respected judgment, agreed that one or two makers have solved most problems of uniformity and control, but still felt that this criticism was a fair one in the long-range sense. There is need for better coordination between discharge and truck speeds, more uniform pressure through the bar, greater uniformity in spray tips or nozzles, and sometimes more pump pressure.

Another California division of highways speaker was less charitable, saying that even the best equipment, on a seal-coat run aimed at say .15 gal. will vary anywhere from .12 to .20 gal. on individual areas. The first 100 ft. of a run will likely be too fat, the last 100 ft. too dry. "Coming out even on the run" is the common effort. Two years ago the manufacturers were asked by the state to submit examples of spray bars, and since then there has been a marked improvement.

In rebuttal, several representatives of bituminous equipment manufacturers reviewed the progress made, which was agreed to be quite impressive. The human element came in for a word. The swamper or fellow on the back end of the distributor is the human equation, and much depends on a good man.

New Finishers

Bituminous spreaders or finishers are still advancing technically, it was reported, at least one maker having pilot models of new machines out on jobs this summer. A spreader specially designed for widening work is needed.

Manufacturers present were asked if they were planning to lengthen their wheelbase on spreaders. In California, as elsewhere, engineers have complained of difficulty in correcting riding quality where uneven pavements are resurfaced. Maintainers have had to be resorted to in spreading the leveling course in some cases, in order to get smoothness. This added equipment necessitates two types of mix for one job.

The importance of not operating a spreader too fast was voiced by an airport engineer, who had experienced some raveling or tearing of the mix due partly to over-speed and partly to working into the rainy season to get a rush job done.

Time limitations prevented detailed discussion of rollers and other equipment. Of rollers, however, it was said that a 3-wheel tandem of 14-18 tons produced the highest densities developed on a plant-mix job. Also that superior smoothness was produced.

●

Eighty per cent of the street lights in use today are 2500 lumens or smaller. According to lighting authorities, that's the smallest size recognized by illuminating engineers for any public lighting except alleys. Modern lamps range up to 33,000 lumens—ample for heavy traffic.

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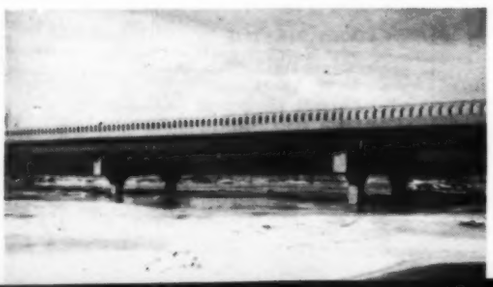
Cuban Engineers at Road Show—The Cuban Engineers' Association will be represented at ARBA Convention and Road Show by a group of 100, who will make the trip from Florida to Chicago on a special train designated as the "Florida and Cuba Road Building Special."

Shims Over Settled Bents Restore Colorado Bridge

When bridge piers settle during a flood, almost anything can happen from there on. Sometimes a new pier or abutment is required, and again an encasement job may be needed, combined with a new seal and footing carried deeper than the original work.

When two piers settled last summer under an I-beam bridge on Highway 71 in Otero County, Colorado, highway maintenance forces watched the structure for a while. Since the piers were on wood piles, it was decided that they would not settle further. So along with a check-up of scour conditions the solution adopted consisted simply of jacking up the deck and inserting steel shims under each line of I-beams at the settled piers. Heavy railroad boot jacks of 50 and 75-ton capacity were employed, working from the top of the cap. Shims consisted of 2-in.-thick steel plates, plus thinner plates needed to get the final height adjustment. A 2½-in. bolt was run through each set of shims and anchored in the cap, according to D. N. Stewart, state maintenance engineer, who gave us these details and the accompanying photos.

★ How the Highway 71 bridge over the Arkansas River in Colorado looked after two piers settled



★ Showing deck restored, and position of shim plates used

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46 Miles Subsurface Drains Installed in Connecticut

MORE than 46 miles of subsurface drainage was installed on various Connecticut state highways from 1940 to 1947, according to a report of Homer R. Turner, engineer of highway drainage in the highway department. This type of installation, made by bureau of roadway maintenances forces, is considered one of the most important factors in the reduction of highway maintenance costs. Removal of subsurface water by this method is highly effective in reducing pavement breakups which are sources of annoyance to motorists and in the aggregate, costly to remedy.

Experimental work with "combination drains," begun in 1941, has given excellent results. Combining perforated pipes with catch basins has proven to be a most satisfactory method of removing ground water and surface water, and is now standard practice where the need is indicated.

Demand on Increase

As a result of the increase in real estate activity during the final war years and since, demands for changes in drainage outlets have shown a marked increase. In Connecticut, easement by adverse possession becomes a statutory fact after 15 years of continued drainage onto private land, provided no objections have been raised by the property owner during the period. In such cases the statute covering this provision places the entire financial burden of drainage improvements on the owner of the property. Attempts to make drainage adjustments under this policy were not satisfactory either to the owner or the highway department. A subsequent policy, adopted upon recommendation of the state attorney general, provides for suggesting to the property owner that he grant a definite drainage easement to the state in lieu of the right acquired by the state by adverse possession.

With the granting of easement, the owner is required only to furnish the necessary pipe. The department furnishes required engineering and installs the pipe. In addition, catch basins, manholes and endwalls are constructed, when needed, at no cost to the owner. The cost of future maintenance is also assumed by the department. Both the land owner

(*Continued on page* 106)

The WOOD PREPARIZER

IT

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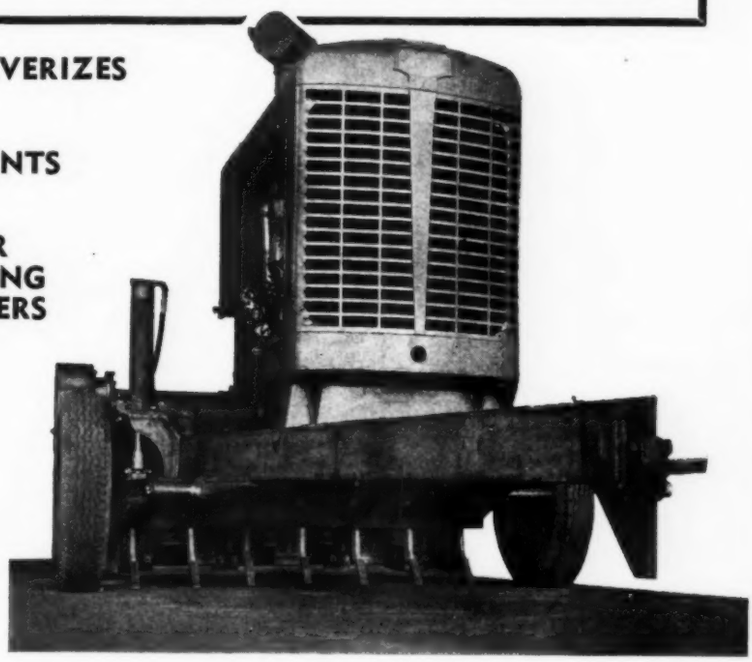

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- A perfect machine for conditioning all types of soils in base courses or wearing surfaces on all mixed-in-place jobs.

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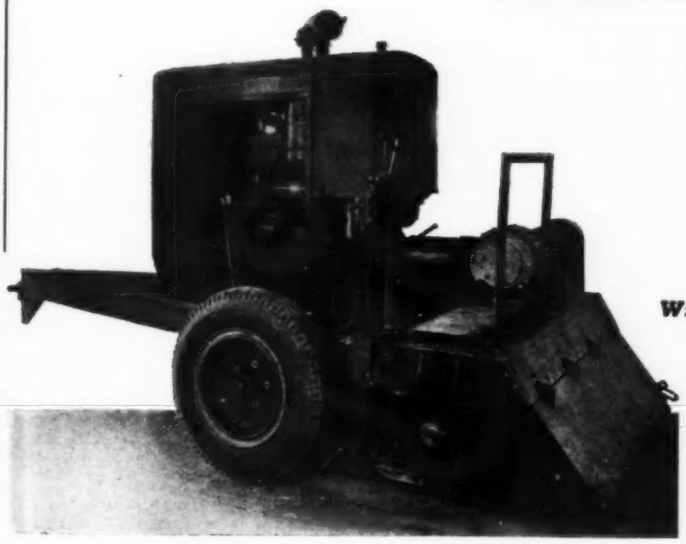

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Two Speedy Wyoming Jobs

Continuing with notes on contractor performance, from May issue of Roads and Streets. Reconstruction of an existing bituminous road is a job that doesn't always lend itself to speedy performance. Much depends on how well the different operations are meshed. And of course on good luck with weather

1

Inland Construction Company moved 150,000 cu. yd. excavation and 36,000 cu. yd. select material in 3 months with minimum equipment.

One of the noteworthy western road reconstruction jobs of 1947 was the 15.3-mile project on the Baggs-Creston road, Rte. 330, Wyoming. Inland Construction Company, Omaha, Nebr., contractor.

This road had failed under heavy traffic induced by development of the Rangely oil field in northern Colorado. It traverses an area abounding in gumbo clays and adobe, which necessitated rather heavy use of granular materials. The new roadbed consists of a three-layer (5"-3½"-5") sand-gravel base 26½ ft. wide, 6 in. depth of select material surfacing spread 31½ ft. wide shoulder to shoulder, and a 1½-in. by 26-ft. compacted oil mat with stone chips spread 24 ft. wide.

Principal items included 225,000 cu. yd. roadway excavation, 56,000 cu. yd. select material, 27,400 tons sand-gravel surfacing, 21,000 cu. yd. salvaged surface material, 15,000 tons oil-treated sand-gravel surfacing, 555 tons MC-0 base material, 975 tons MC-O mat material, and 355 tons RC-4 seal.

Job Time Clock

The contractor began clearing the right-of-way on June 16, using three Terra Cobras, a patrol grader and two push tractors. The existing oil mat was broken up and stock-piled as a preliminary step. On June 26 more equipment began, consisting of a tractor and ripper, two sheepsfoot roller units, and a tractor-drawn scraper. Grading started July 3 and hauling of select material started July 21, both operations being completed by Oct. 20. The base course was completely processed by November 8.

During July, 52,000 cu. yd. of excavation and 7,000 cu. yd. of select material were moved; during August, 82,000 cu. yd. and 15,000 cu. yd. respectively; during September, 48,000 cu. yd. and 24,000 cu. yd. Approximately 5 miles of oil-treated surfacing was mixed and placed from Sept. 8 to Sept. 25, when this part of work was shut down for the winter.

Surface material was scarce on this job, and the select material surfacing consisted mainly of fine sand. After removing the oil mat, the embankment was reconstructed to the wider cross-section, then additional sand added for the gravel base. The Terra Cobras were used mostly for the longer hauls of select material, although some grading was also performed with these self-powered units as well as with the tractor-drawn scrapers. On a few comparatively short sections as much as 18 in. depth of sandy material was placed on the clay subgrade in addition to the 6 in. select base and the gravel course. Material was obtained from nine sources along the project.

28-Machine Outfit

The contractor's complete outfit comprised the following:

3 Wooldridge Terra Cobras self-propelled 15-18 yd. scrapers
4 D8 Caterpillar tractors with LeTourneau scrapers 1-25 yd., 2-15 yd., 2-12 yd.
1 D8 tractor with Garland 14 yd. scraper
2 International TD-18 tractors with 13½ yd. Bucyrus-Erie scrapers
3 RD 8 push tractors
2 McCoy 325 psi. sheepsfoot rollers
1 Bros 324 psi. sheepsfoot roller
2 Rippers
2 RD 8 dozers
7 Water trucks
1 Woods travel plant

A. B. Nuss, Vice Pres., and Jesse S. Dockery, superintendent, represented Inland Construction Company; C. E. Gattis was project engineer, Talcott Moore, construction engineer, and J. R. Bromley, superintendent, Wyoming highway department.

2

Tagart Construction Company averaged a mile of widened and rebuilt subgrade each 2½ days; 610 truck loads dumped on road in peak 16-hour day with 17-mile haul.

Another interesting Wyoming project initiated in 1947, was the 19-mile improvement on the Kaycee-Midwest section of U.S. 87 in Johnson County. Taggart Construction Co., Cody, Wyo., contractor.

As reported to ROADS AND STREETS by Grover O. Powers, project engineer, this project (two contract sections), consisted of widening subgrade, constructing base and subgrade, and placement of oil mat. Also stock-piling of ¾-in. crushed material for maintenance. Contract price $444,739.

Machine-Hour Prices

All of the subgrade work was contracted on an hourly basis for scraper, grader, dozer and roller operations. The following hours were required in widening the subgrade from the existing 24 ft. to the new 30 ft. width and in flattening cut slopes, improving sight distance on vertical curves and improving steep fill slopes:

Scraper-hours	522
Patrol-hours	147
Sheepsfoot Roller-hours	235
Bulldozer-hours	196

The existing subgrade consisted of heavy A-6 and A-7 soils throughout,

★ Oil mat surface completed except for armor coat, Inland Construction Company's job

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1 **Wherever a truck can go, and at truck speed, that's where you can take a "*QUICK-WAY*." Low center of gravity and proper balance does it.**

2 **Speed on the job moves more material per day at less cost—a "*QUICK-WAY*" gets around fast.**

3 **First in the field and still the leader, "*QUICK-WAYS*" have gotten around more and longer than any other truck mounted power shovel.**

Service available from our distributors strategically located throughout the United States and worldwide

Model E: 4/10 cu. yd. cap., for mounting on any standard 5-ton truck.
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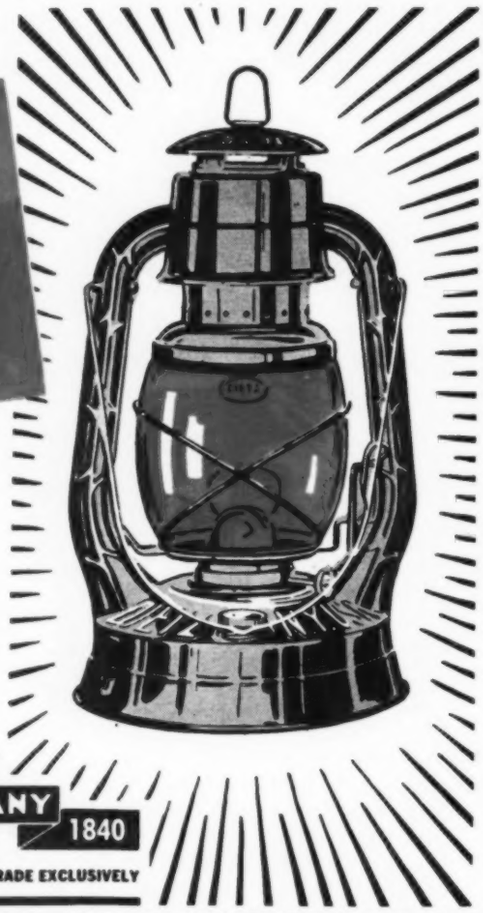

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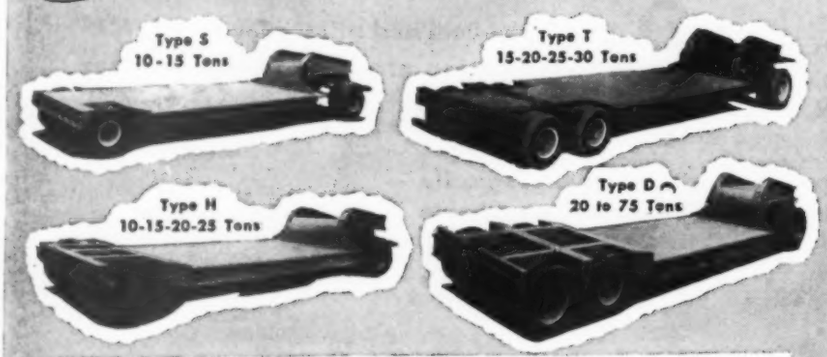

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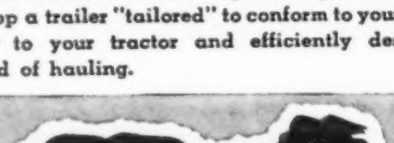

ROGERS BROTHERS CORPORATION

DESIGNERS and BUILDERS of HEAVY DUTY TRAILERS SINCE 1915

much of it saturated. The existing subgrade was covered with an oil mat with many patches, making a tough oil surfacing from 2 to 6 in. in thickness. This surfacing was scarified and windrowed along the centerline, while additional subgrade material was placed and rolled in along shoulders to increase width of roadbed.

The oil material was then spread over the new subgrade. This material was a great help in holding the subgrade in shape prior to base course surfacing. The work was started in July at the peak of the tourist season, and all traffic had to be routed through the work.

The tear-up and subsequent grading were started at the Midwest end of the project and carried through to the Kaycee end in approximately half-mile sections. Base course surfacing was started when about 5 miles of the subgrade widening had been completed.

The base course consisted of a 7-in. layer of 2-in.-max. crushed gravel, covered by a 3-in. layer of 1-in. crushed gravel. 94,285 tons of 2-in.-max. gravel base course and 26,824 tons of 1-in. gravel base course were used. This top course was base treated with MC-O Road Oil.

A 2-in. oil treated mat was placed over the base course using ¾-in.-max. crushed gravel and MC-3 liquid asphalt.

23,500 tons of ¾ max. crushed gravel was produced for the oil mat, plus 10,000 tons for maintenance material which was stockpiled at the Midwest end. This material was produced from 3 pits having approximately 2 miles dead haul from the Kaycee end. The largest item of the project was the ton-mile haul of the crushed gravel, being 2,009,600 ton-miles or the equivalent of making 10 trips around the world with one 8-ton truck load of gravel and then 10 trips empty for the return!

Equipment used in the project:

3 18-20 c. y. scrapers, pulled by D-8 Caterpillars
4 Motor patrols
3 D-8 Caterpillar dozers
4 2,000-gal. water trucks
25 to 75 hired dump trucks (1½ and 2 ton)
1 Cedar Rapids traveling oil mixing plant

All subgrade work was completed in 50 working days or at the rate of 2.5 days for each mile; two eight-hour shifts per working day.

Good Crusher Output

The rock crusher produced an average of 200 tons per hour of 2-in.-max. with the top production of 287 tons per hour. It averaged 150 tons per hour on the 1-in.-max. and 125 tons per hr. on the ¾-in.-max. One day while producing 2-in. material with an average haul of 17 miles, 80 dump trucks were used and 640 loads were placed on the

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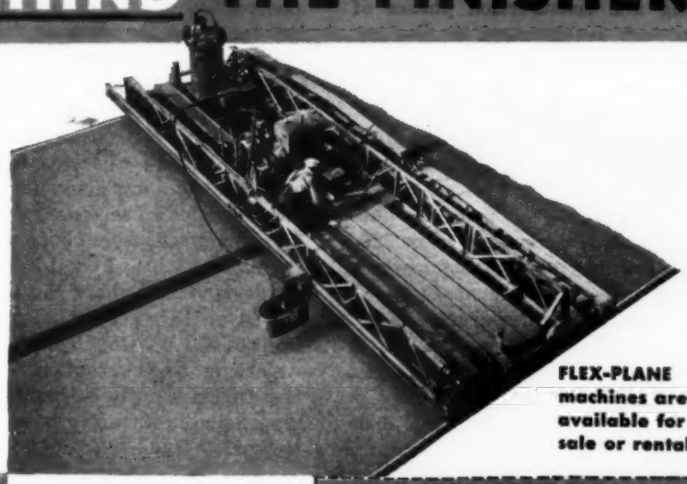

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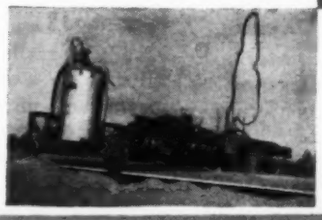
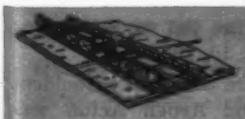


ABOVE—One type of Flex-Plane combination machine which automatically—

- BROOM FINISHES
- INSTALLS PERMANENT TRAFFIC LINE
- SPRAY CURES



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We Need 2700 New Airports

Facts as they stand today on state aid for civil airports

SOME 2090 existing public airports should be improved, and 2,745 new ones should be built throughout the country during the next three years. This was reported by the Civil Aeronautics Administration in its current National Airport Plan. Such development of airports under Federal aid is considered barely adequate to anticipate and meet the needs of civil aeronautics at the end of the three-year period.

The report contains an estimate of slightly more than $1 billion as the cost of this nation-wide program involving 4,835 projects. Broken down to show the average cost of airport development per locations, we come up with a figure of $217,000 for this particular program. To be sure, Federal aid funds are authorized to pay the United States share of this billion dollar cost. But, the sponsors' share is another story!

Sponsors' Share

Local Sponsors of projects must provide 75% of the funds for necessary land acquisition. In most cases, they also bear 50% of the costs of planning and construction phases of new airport development or the improvement of old ones. The sponsors' portion adds up to $578,800,000 . . . no small amount!

Exceptions to these rules of sharing cost of Federal aid airport development are at locations in 13 states which contain 5% or more of public and nontaxable Indian lands. To compensate for greater benefits which accrue to the government in these areas, the United States share of costs for airport construction in these states is somewhat more than in most states, ranging from 51.67% at locations in Oklahoma to 62½% in Nevada. The Federal share on 30 projects outlined for Alaska during the next three years is 75% for construction.

Pride among local citizens in the knowledge that their towns will become terminal points on important airways, and thus benefit substantially from such advantages, make up one side of the picture. On the other side, those same citizens become somewhat dismayed when contemplating their share of cost. But, the advantages of airport development far outweigh this consideration in acquiring landing facilities for air transportation.

Of the 4,835 necessary projects, 4,333 are relatively small ones. And if these small ones are considered alone, the average cost would be considerably less than the average of $217,000 mentioned for each location. The development of these airfields is to provide orderly growth of air transportation in all of its phases so that the nation and each of the states may be provided with a balanced airport system to serve civil needs and—should the need arise—possess landing facilities for national defense.

States Should Share

Many sponsors of airports contend they should not bear the local share of airport costs alone. Logic and justice are on their side since airport development benefits counties and states in which they are located to an extent equal to or more that on-the-site citizens. Local sponsors maintain that states need an integrated system of airports, otherwise its citizens who are airport users might be without suitable landing facilities at many of the state's cities and towns. Local sponsors feel that a community should be assisted by the state in providing landing facilities for citizens from other areas in the state who might wish to use that community's airports.

Fortunately, there are provisions in the Federal Airport Act whereby sponsors' share of funds for Federal aid airports may come from one or more sources. Therefore, not only the immediate sponsors but states and counties in which Federal aid airports are located may share the expense involved in their accomplishment. L. L. Schroeder, Past President of the American Association of State Aviation Officials, aptly outlined the states' responsibility in airport development. He said:

"A state's responsibility is almost the same as that of the Federal Government insofar as it affects fostering air commerce within its geographic area. The state must be concerned with the adequacy of the pattern, plan, and development of airports which serve municipalities within its boundaries. Above all, the states as they discharge their responsibility in connection with the development of this new industry must maintain the closest intergovernmental coordination as among themselves and as between the municipalities on the one hand and the Federal government on the other."

In the few states which grant state aid for airport development, a formula approximately 50% federal, 25% state and 25% sponsor is used to cover the cost of Federal aid airport development. In some cases, the municipality and the county in which a project is located divide the sponsor's share, each assuming 12½%. Advocates of states assuming a portion of this cost maintain that it is not burdensome. They point out that an average state has had approximately $7,000,000 apportioned to it as Federal aid for airport development to be accomplished in seven years. That means a program costing at least $14,000,000. On the assumption that the state shared equally in the sponsors' portion of the cost, the average annual outlay by the state, to augment the local communities' contributions, would amount to only $490,000 per year.

Under such a plan, the state would play an important role in shaping the magnitude of the pattern, plan and development of the airports which serve the municipalities within its boundaries.

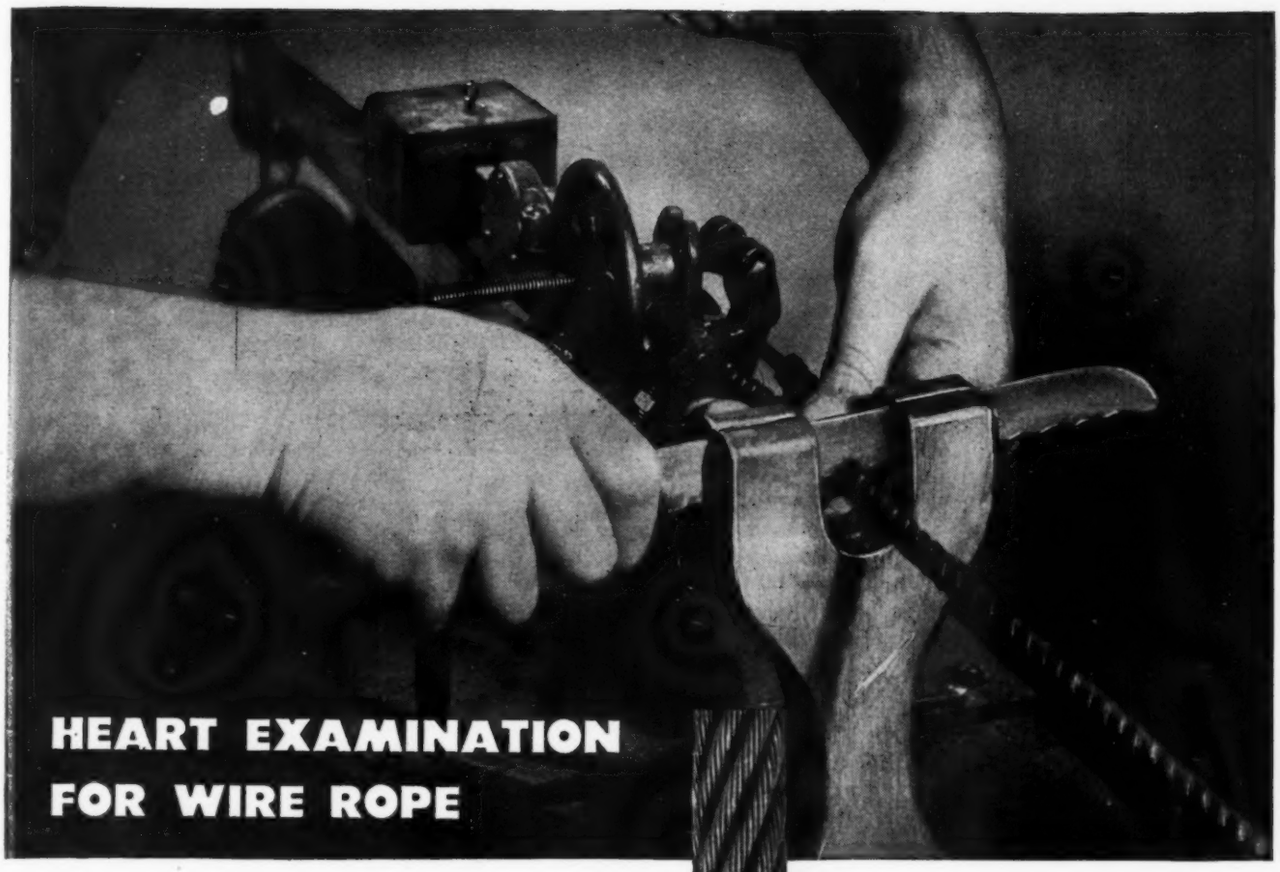
Two Speedy Wyoming Jobs

(*Continued. from page* 80)

road in 16 hrs. making a load of gravel dumped each 1½ minutes.

Approximately 9 miles of the oil mat was road mix and laid by Sept. 15, at which time a traveling oil mixing plant was rented so that the oiling could continue during the cooler weather. The last of the oil mat was laid on Oct. 16, 1947. The weather was hot and dry from the time of beginning of work in July until Sept. 1, 1947, and even then it remained unusually warm, with only 3 or 4 days of rain up to Oct. 5. A fairly severe storm came on Oct. 14, 1947, with approximately 2 inches of snow, but the job was completed except for stone chips which were crushed and stockpiled after the weather cleared. Work was suspended for the winter by the engineer on Oct. 10, 1947.

Jesse E. Moore was superintendent on this job, and Arden Acton was grading foreman.



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Because of these important functions, the centers used in Wickwire Rope must pass exhaustive tests at the cordage manufacturer's plant and in Wickwire's Testing Laboratory. Centers must be made of the highest quality fiber; absolutely uniform in diameter, density and length of lay. The rope must be lubricated to the point of saturation and, where called for, an identifying marker tape must be spun into the rope.

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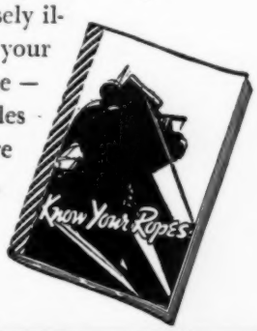
Thousands of wire rope users have found that the information packed in the pages of "Know Your Ropes" has made their work easier. It's full of suggestions on proper selection, application and usage of wire rope. It's easy-to-read and profusely illustrated. For your free copy, write — Wire Rope Sales Office, Wickwire Spencer Steel, Palmer, Mass.



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PACIFIC COAST SUBSIDIARY—The California Wire Cloth Corp., Oakland 6, Cal.

★ Looking toward the Bay along San Francisco's famous "main drag". One inner track torn out, other (under grader) not yet disturbed. Outer tracks on either side not involved in present reconstruction project

San Francisco's Market Street Gets New

Track Zone Pavement

★ This labor-saving rig was devised to drill a row of holes along the zone edge, to form a weakened plane after which the slab could be broken out in a uniform line with a skull cracker. It consists of four wagon drill units, mounted in a row outside one rail. Mounting consists of a welded pipe frame, supported on a hand-car

Two husky loaders, five compressors, a modified shovel, and gang-mounted rock drills helped contractor complete 6335-ft. double-track repaving contract with 100-day limit clause

★ A tractor-mounted loader (Traxcavator) performing clean-up excavation. Rear boom used for various pick-up and unloading duties

ANYTHING that interrupts traffic along Market Street is bad news for congested San Francisco. So "hurry-up" was the word on Eaton & Smith's track reconstruction and repaving project, as seen in progress early in 1948 along 6335 feet of Market Street for the Public Utilities Commission. This contracting firm bid $250,000 for the job of tearing out and replacing a 21-ft. wide center zone, taking in the two inner tracks of the thoroughfare's four-street railway tracks.

The old pavement consisted of 2½ in. of asphaltic materials on a 7-in. concrete base, with 110-lb. rails and cross ties embedded therein. While

tough stuff to excavate, it had worn under traffic to the point where railway service was impaired. The new construction will include a heavy rock ballast base in addition to concrete base and asphalt topping, and new 134-lb. 9-in. girder rail on 6" x 8" redwood or cedar cross ties.

Rail Removal Tough

Several methods of ripping up the old rails were tried. The procedure found most successful was to use two D7 Caterpillar-Traxcavators as a team, stationed facing each other crossways with the street. These machines each exerted lifting power on a section of rail which had previously been burned through on an angle, to avoid the possible jamming of a butt torch line. Lifting was done with tongs attached to the buckets, and anchored to the rail at a pocket dug out of the adjacent pavement. About 15 to 20 ft. of rail was thus pried up, then the loaders moved and an additional section was raised, and so on until the rail snapped. Or if the rail remained continuous after about 50 feet was exposed, a second pocket was dug, rail burned through and the process repeated.

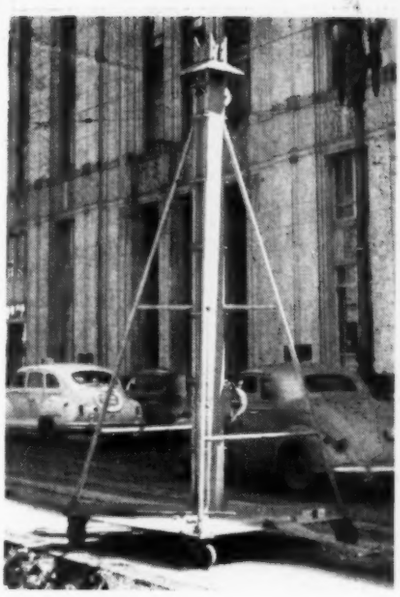
Sections of rail on removal were piled on carrier blocks by a small boom tractor and later picked up with a lumber carrier and removed from the job.

Excavation of old pavement and stone ballast was performed by a Northwest No. 6 shovel, specially modified for this type of work. This shovel suffered the ignominy of having a rubber hose mounted over the boom sheave, to insulate against contact with trolley wires. And the dipper sticks were shortened about 3 ft. to keep them from racking dangerously high toward the wires. The 1½-yd. bucket was widened to 2-yd. capacity, to aid in scooping up big chunks of broken pavement while making relatively shallow cuts.

Speedy Concrete "Cutting"

The final clean-out cut was made by a 2½-yd. Traxcavator loader at locations left high by the shovel, where underground pipes, etc., were above sub-grade. This work was assisted by a No. 12 Caterpillar blade which also helped dislodge partly embedded ties and trimmed the subgrade. This blade also spread 6 in. of crushed rock subballast on the sub-grade. An 8-10 ton tandem roller compressed the subballast.

Concrete breakers were used copi-



★ Trolley wire lifter, used to insure clearance for equipment where necessary. Hand-operated winch cable passes up the column, over a sheave, and down inside the hollow steel column to anchorage at base of an inserted wood post. Post is thus forced up until a notch at top contacts wire and lifts it

★ (Upper Left): The loader helping fill power shovel dipper with broken pavement and debris. (Upper Right): When possible in excavating intersections, trucks were backed into cross-position shown, thus keeping railway line clear. (Lower Left): Sometimes it was expedient to load old unearthed timbers into the dipper by hand. (Lower Right): 1¼-yd. shovel modified for this job: dipper widened to 2-yd. capacity, for greater speed in shallow work; dipper sticks shortened 3 ft. and boom sheave protected by a crown of rubber hose, to insure against contact with trolley wires

★ This contractor believes in the economy of hard-facing parts that receive severe abrasion. Note beads along face and side plates of front-end scoop, and on inside and outside surfaces of shovel dipper

★ Another view of the special drill rig, showing how a power unit from an earth wagon was borrowed for towing

ously all along the job, of course, being chiefly required at intersections, around rail crossings and turn-outs and for excavating rail grip pockets for rail removal. But the main job of concrete drilling was that of putting down a line of holes along the outer edge of the removal zone, 2 ft. beyond the outer rails to be removed. This work was greatly speeded up by means of a special rig devised by the contractor's men, consisting of a line of four drifters from Gardner-Denver No. 179 wagon drills mounted on a frame and towed on a railroad hand-car. A Euclid tractor earth-moving unit proved handy for the towing.

The procedure was to drill four parallel holes about a foot apart, then move along and drill another group of holes, and so on, working usually on the day shift, and occasionally at night. Along with the hole drilling, the boundary line was completely scored with pavement breaker chuck tools.

In a typical 9-hour run, this outfit drilled some 2,000 holes and scored as many lineal feet of pavement line. With holes put down at this interval it was no trick for the shovel to rip up concrete. A 500 cfm Chicago Pneumatic and a 210 cfm Worthington compressor powered this outfit, while four smaller mobile compressors consisting of a 105 Le Roi, a 105 Chi Pneumatic, and a 105 and 210 Worthington, served the pavement breakers up and down the line, doing various jobs.

Contract Details

That just about describes the way Eaton & Smith cleaned out the old pavement, except that we might mention a cleverly devised trolley wire lifter-upper. This unit, often needed to assure clearance for the shovel or other equipment, consisted of a hollow vertically-mounted shaft, inside of which a wooden post could be raised or lowered with a hand winch. The post was made to protrude out of the top of the shaft until it contacted and raised the trolley wire to the height desired. The device was castor-mounted, and light enough to be moved by hand, yet mobile enough to be towed through the streets by a pick-up.

Standard paving methods including a base of ready-mixed concrete and an A.C. surface were employed for the repaving.

The contract included the following estimated quantities: 9,500 cu. yd. of track trench comprising old pavement, ballast. and earth removal; 25,000 sq. yd. of new 7-in. concrete pavement and 2-in. asphaltic surface; 12,000 lin. ft. single track and 1,500 ft. special track removal; burning through 3,000 old iron cable yokes (remaining from days when cable cars ran on Market St.); placement 500 lin. ft. of 6-in. vitrified pipe drains and 1,500 ft. of sub-drains; placement 5,400 cu. yd. of crushed rock ballast; placement 12,500 lin. ft. new track and 2,000 ft. special track; thermit welding 450 joints; miscellaneous items.

The contractor used about 125 men on three 7-hour shifts for a while, confining night operations to about 20 men on track work, but went to a single 8-hour shift after passing through the most congested area. Robert Smith acted as superintendent for Eaton & Smith. Eugene Bush was resident engineer and H. E. Lloyd, construction engineer for the City and County of San Francisco Public Utilities Commission, of which A. O. Olson is manager and chief engineer, power and utilities engineering bureau, and L. V. Degnan, senior civil engineer in charge of railway engineering.

★ (Left): A cherry picker was used to unload and set new rails. (Right): Small portable compressors (this one a Chicago Pneumatic) and pavement breakers took out old concrete at intersections and around special track

Computing Water Flow

By W. F. Schaphorst, M.E.
Newark, N.J.

Next Time You Have a Pipe Problem Make Use of This Novel Chart.

WE often want to know certain things about pipe, and we want to know quickly. We may want to know the cubic feet of liquid or gas flowing through the pipe per minute, the gallons per minute, the pounds of water per minute, the velocity of flow, or the exact internal diameter of the pipe regardless of its standard.

All of these quantities are more or less dependent upon each other, of course, the important question usually being the true size of the pipe. Since pipe sizes vary as they do, standard pipe not being exact in internal diameter and extra heavy pipe being different also, it is frequently necessary to search through tables and make more or less lengthy calculations before arriving at the result. And then, after a result is arrived at, one is not always certain that the answer is correct.

Here is a chart that takes care of most of these matters in a decidedly simple way. The best way to explain the method of application of the chart is to give a problem.

(1) There are three sets of figures given in connection with the extreme left hand column which is designated as column A. The first column of figures at the left, marked "1 Standard" gives the actual internal diameter of standard pipe. This column shows, for example, that the internal diameter of a 1 in. standard pipe is somewhat greater than 1 in. because the column of figures marked "2 Exact" gives the exact diameter. Thus, if we have a pipe the internal diameter of which is exactly 2 in. as used in the problem which is cited below, we use this column of figures. The next column of figures, marked "3 Extra Heavy" gives the actual internal diameter of a 1 in. extra heavy pipe as less than 1 in.

(2) Apply chart to a problem, as follows: How much water is passing through a pipe having an internal diameter of exactly 2 in., the velocity of the water being 2 ft. per second?

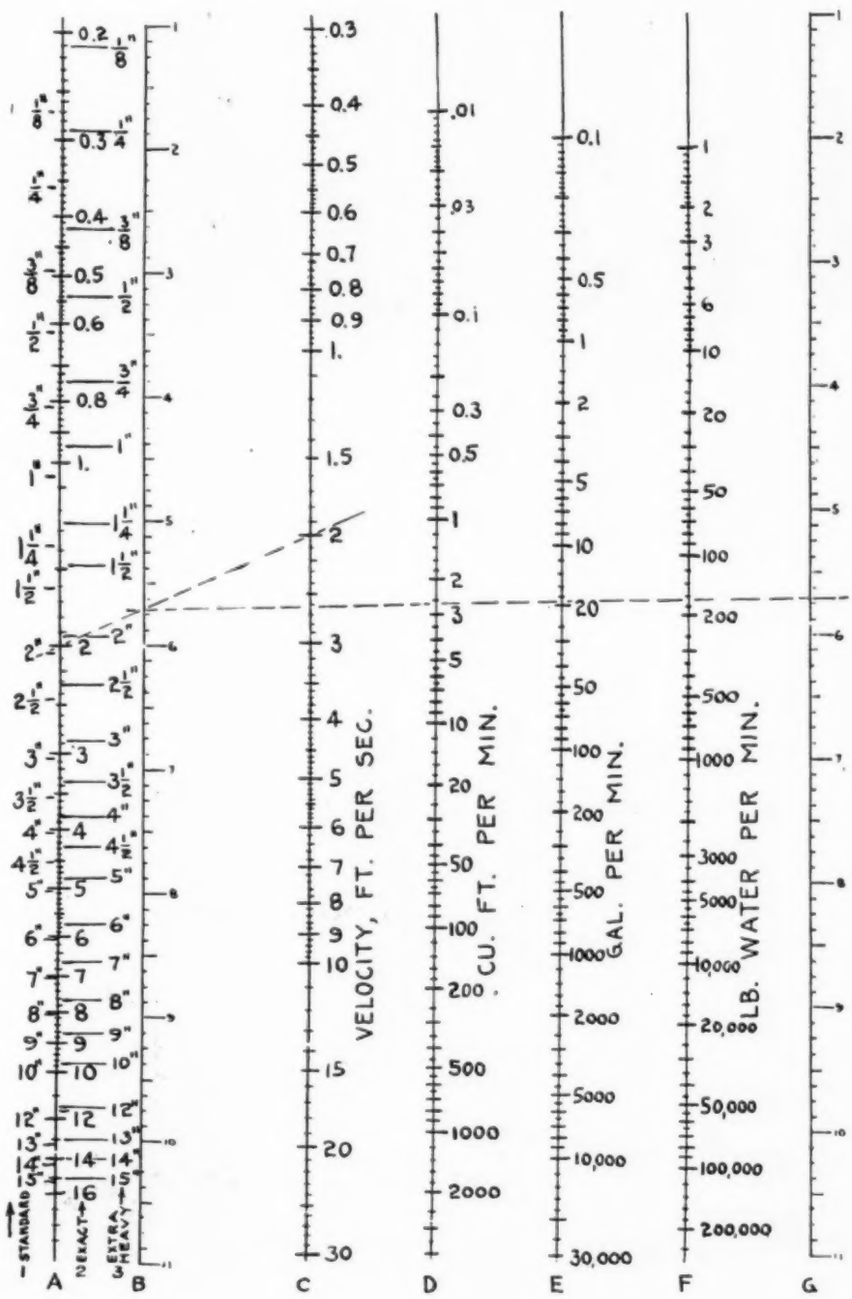
Locate the 2 in. column A over the word "exact" and from its point of intersection run a straight line through the 2 ft. per second in column C as shown by the slanted dotted line. This straight line intersects column B. From the point of intersection in column B run a straight line over to the identical point in column G, also as shown by the dotted line. The intersection of this perfectly horizontal line from column B to column G gives answers simultaneously in the three columns D, E, and F. It shows that, according to column D, 2.6 ft. per min. are flowing through the pipe. Column E shows that the volume of flow amounts to 19.5 gallons per minute. And column F tells us that if it is water the weight of that water is about 165 pounds per minute.

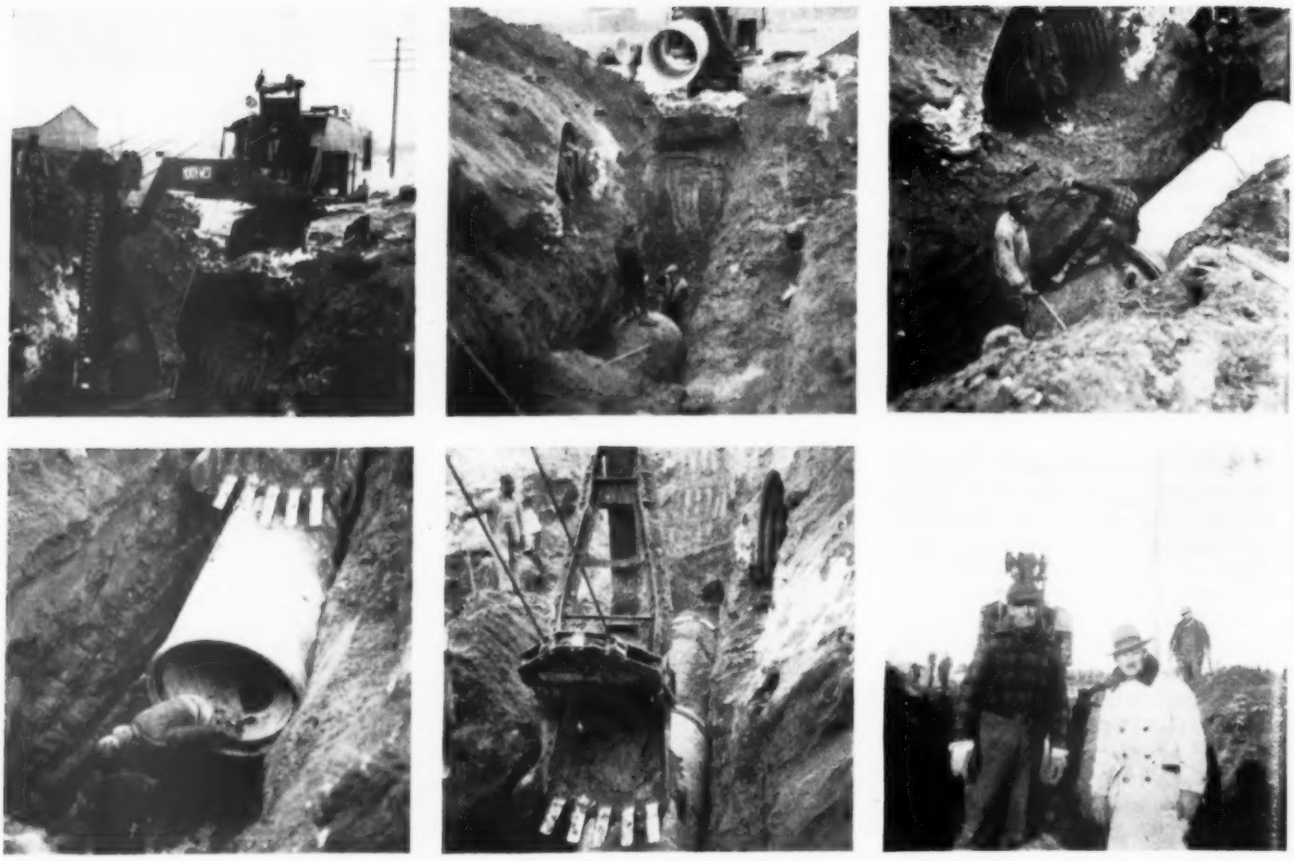
(3) It is evident now, on studying the chart, that if the pipe were a 2-in. standard pipe instead of being exactly 2 in., the horizontal line from column B to column G would be slightly lower and the three quantities in columns D, E, and F would be slightly greater. On the other hand it is evident that if a 2-in. extra heavy pipe were used instead of a 2-in. exact, the horizontal line from column B to G would be raised slightly above its shown position and the three quantities in columns D, E, and F would therefore be slightly less.

(4) Inversely, if any quantity in columns D, E, and F is known and it is desired to determine the velocity per second of flow through the pipe, this same chart can be used with equal ease. First run the horizontal line through the known point in D, E, or F and then through the located point in column B run a straight line from the known pipe diameter, and the intersection with column C immediately gives the velocity of the liquid in ft. per second.

(5) Or, if you wish to select a pipe size, knowing any one of the quantities

(*Continued on page* 93)





★ This interesting sequence shows excavating, swinging pipe into place, lowering the spigot into the bell, and pushing the pipe home—all done with the pull shovel. Al Cicchini, the laying foreman, and L. H. Brenner, engineer-superintendent for the contractor, looking handsome for the cameraman

Fast Work on Saginaw-Midland

Water Supply Pipeline

★ Making the mortar joints

LAYING of 55 sixteen-foot lengths of 48-in. diameter concrete pipe in 12 hours is quite a day's work. This peak day was achieved on the Saginaw-Midland Water Project last season by Johnson-Greene Company and Walter Toebe & Co., contractors of Ann Arbor, Michigan.

The same outfit averaged 16 lengths of pipe per ten-hour day for this 8-mile water supply project, in spite of being slowed up by a river crossing.

The contract called for the laying of Lock Joint pipe, complete with blow-offs, manholes and other details. The pipe sections weighed approximately 6 tons each. The line was to supply a much needed new source of water for the two cities.

The average cut to the flow line was 8 feet. This excavation and the placing

of the pipe were accomplished with a 1½-yd. Northwest pull shovel. A hook and sling arrangement attached to the bucket was used to swing the pipe into place and push the pipe to a tight joint. Backfilling was done with a Caterpillar tractor with bulldozer, the tractor having narrow gauge tracks that helped in compacting the backfill.

The project was started July 1, 1947, and completed Feb. 1, 1948. During this period, two rivers and a railroad track were negotiated. It was necessary to stay 4 ft. below the stream bed of the rivers and 8 ft. below the rails of the track crossings.

The railroad track-laying was accomplished by placing LeMar reinforced concrete pipe of a large enough diameter that the carrier pipe was placed inside it still leaving space to make joints and encase with grout for bearing. The river crossings were constructed with the same Lock Joint pipe as was used throughout the project; however, progress was slowed to a degree due to water, bad bottom and exceptionally deep cut.

The key personnel on this job were the Northwest operator, Angelo Leo, the laying foreman, Al. Cicchini, the concrete foremen, Gordon Fayette, and L. H. Brenner, engineer-superintendent.

★ General view of the pipe-laying project, in rather shallow excavation

Job and Equipment Ideas

Pans Work Two Ways from Cut in Fig. "8" Pattern

A time-saving procedure that might be worked more often was reported for a short (1.5 miles) grading job near Asheville, N. C. The *Carolina Road Builder* describes this job, on which Asheville Const. Co. was the contractor. The $52,707 roadway project involved 9 acres of clearing, 5 acres of grubbing, 178,000 c.y. of unclassified excavation, 13,800 c.y. of borrow excavation.

The main cut, between stations 74 and 78, contains 66,000 c.y. On either end of the cut, which was 40 ft. deep, were fill sections extending from station 71 and 74 on one side and 78 to 86 on the other. Three tractors pulling 12-yd. pans were worked on the cut to make the fill sections. Each pan traveled in the pattern of a figure eight to visit the fills alternately. Crossing the grade at the cut to the opposite lying fill, each pan loaded, unloaded at the fill, made a single turn, crossed the cut, again loading, passed to the other fill, unloaded, and returned to the cut. Thus, in a single operation one pan was able to load and unload twice, and work a cut and two fills in consecutive order. Such a procedure eliminated unnecessary turning at cut and fill sections.

P. T. Reese was superintendent for the contractor. J. C. Walker, George R. Prescott and F. F. Merrill served as highway department division engineer, resident engineer, and inspector respectively.

Preparation for Concrete Patching

Arkansas has a considerable mileage of concrete pavement which has broken up rather extensively in places due to pumping action at joints, according to a recent issue of "Highway Research Abstracts."

For marking boundaries of area to be broken out, a concrete saw is used, consisting of a diamond edged circular blade either 10- or 12-in. in diameter driven by a 6-hp. gasoline engine.

A kerf averaging 2 in. in depth is made at the rate of approximately one lineal ft. per min. Only one man is required for this operation. After the limits of the patch have been thus defined, a self-propelled pneumatic paving breaker, mounted on a tricycle chassis, is put to work. This machine has a 600-lb. hammer with an impact of 3,000 to 3,500 lb. which rapidly breaks up the concrete into fragments of any desired size. An air compressor, mounted on a truck, completes this unit, which also requires only one man for operation as the breaker is coupled to the truck and towed from one location to another.

By using these two pieces of equipment, almost all spalling beyond the limits of the cut is eliminated, and a much better construction joint between the new and old concrete is obtained. Results have been so satisfactory that more units of this equipment are being acquired.

●

The safety value of limited-access, divided-lane highways which have all cross traffic separated is shown by statistics for the Merritt Parkway in Connecticut. This modern highway is *six times as safe* as parallel U.S. 1, an ordinary 4-lane road. The death rate on a test section is only 2.46 per 100,000,000 vehicle-miles, as compared with 8.6 national average.

"Second Story" Concrete

Built without Transverse Joints

Old concrete pavement also made monolithic by cleaning and grouting joints before resurfacing

TWO features serve to make noteworthy a recently completed concrete resurfacing on a 5-mile section of the Montauk Highway near Long Island's easterly tip. This highway is the main artery along the South Shore of Long Island from New York to Montauk Point.

The project was built without transverse joints. Construction joints at points of work stoppage were tied together with tie rods so that the entire five miles was constructed as a continuous slab. Joints in the old concrete pavement were cleaned and grouted in an effort to make the base also monolithic. Hence the slab is free to form its own joints. The road will be under close observation to determine when and where the cracks develop.

★ Resurface paving was placed one lane at a time. Note old pavement was trenched through at centerline, to permit setting of forms for the first lane pour

★ Simple work-saving screed drawn by paver. This resurface was made without transverse joints, except at doweled stopping points. Wire reinforcement used, however

The old 20-ft. pavement was widened to 24 ft. with 9 in. of concrete 2 ft. wide on each side. The new slab was placed one lane at a time, which necessitated setting forms along the centerline over the old slab. Recent developments in concrete cutting and breaking tools made it more economical for the contractor to break out enough old pavement at one side of the old center joint, than to drill holes for form pins. This center groove was backfilled to a sufficient height to form a base for a 9-in. form. The minimum thickness of new concrete along this center form was 5 in.

The original pavement, 7 in. thick, was built by the Town of Easthampton in 1927. This 20-year-old pavement crossed Napeague Beach, where the Atlantic Ocean continually threatens to break through into the bay, and was placed upon an unstable beach sand foundation. It was severely punished by heavy traffic to Army and Navy installations at Montauk Point during World War II, but its worst fault was still its poor riding quality due to unequal settlement. As the State had paved the Montauk Highway from the easterly end of this Town Road to the Point, the Town naturally wished to be relieved of this gap in the State system and applied for its improvement as a State Highway. The decision to use concrete for both resurfacing and widening was reached after comparative cost studies, and was influenced by the economy of confining the entire construction to one type of paving material and by the availability of local aggregates.

The mix was 1-1.75-3.5 with gravel aggregate, and the reinforcement deviated from the standard of 63 lb. per 100 sq. ft. only by the elimination of the 5-ft. end mats which were placed only at beginning and end of each day's work.

This contract, known as R.C. 46-75 Amagansett-Montauk Point, Pt. 1, was let in 1946 and built in 1947. The contractor was the Andrew Weston Company, Inc. of Woodmere, M.O.P. Coulling, superintendent. It was built under the supervision of J. J. Darcy, district engineer, J. A. Flinn, construction supervisor and M. C. Nemschick, resident engineer, for the N. Y. State Department of Public Works.

All Set? Hope to see you and all your top personnel at the Road Show—Chicago, July 16-24

★ Nearly 700 hungry Texans joined in this occasion of good fellowship

★ At the Texas "Peddlers" Banquet. (Left to Right): T. B. Warden, member, Texas board of control; H. B. Zachry, H. B. Zachry Company, General Contractors, San Antonio; Delbert Downing, chamber of commerce, Midland, Texas; Fred Wemple, member, Texas highway commission; J. M. Page, PRA district engineer, Austin; Dr. Carl P. Thompson, Oklahoma A & M College (speaker); Col. Ike Ashburn, exec. v. p., Texas good roads association; D. C. Greer, state highway engineer of Texas; T. H. Webb, ass't state highway engineer; M. B. Killian, president, F. W. Heldenfels, Jr., vice-pres., and Chas. H. Newell, manager, Texas highway branch AGC; respectively; Hall Logan, chairman, state board of control, Austin; Harold J. McKeever, Editor "Roads and Streets," Chicago

Texans Meet at "Peddlers" Banquet

An editorial word on a pleasant and purposeful custom which seems to be helping John Q. Taxpayer in Texas

DOWN at Austin on the night of May 11, more than seven hundred Texas highway engineers, contractors and material and machinery men crowded into a couple of banquet halls. The occasion was the "Peddlers" banquet, which has been staged every year or so of late. Uusually the dinner is timed to go with a big spring letting, and this year a 2-day letting of nearly $11,000,000 worth of road and bridge projects helped add to the fellowship.

The "Peddlers," or more formally, Highway Construction Suppliers, is a voluntary and informal organization in the state which has as its aim the fostering of good fellowship and a feeling of mutual respect and trust between the engineers, contractors and purveyors of materials and equipment. The banquet is part of the scheme, based on the sound idea that men understand each other better and solve their differences, if any, more easily when they can get together now and then and become better acquainted. No business transactions or talk is allowed at these banquets. The "Peddlers" foot the bill, and we think it is money well invested.

The idea of these Texas get-togethers seems to have begun back in the 30's. The Texas highway chapter of AGC, under secretary "Chuck" Newell, did some of the spade work, beginning at a time when contractor-engineer relationships were said to be somewhat strained. At any rate, all parties have contributed to the good feeling which exists today. And this relationship is regarded by everyone concerned as a contributing factor in Texas' big and efficient showing in postwar road construction.

Contractor Suggestions

As a result of all this effort, today when a contractor or a contractor group makes a suggestion, the highway department leaders give it speedy and serious consideration, knowing that it was made in full sincerity. The latest example was the suggestion made recently that hot-mix work shut down in Texas from Dec. 1 until a specified time in March. The highway department has agreed to put this ruling into effect for a trial, and the May lettings were based on the ruling. Next winter, all hot-mix contractors will be idle, in spite of the fact that in a good part of the state the mild climate will often favor some work.

The winter lay-over plan is expected to benefit contractors in three ways: They won't be doing work under adverse conditions (winter hot-mix work is said to be generally unprofitable to them). They won't be sniping at each other's men, as when some are working and others aren't. And there will be fewer northern contractors down in Texas looking for winter work.

D. C. Greer, state highway engineer, who by the way is himself one of the best single reasons for this "Texas harmony" will, of course, watch this new arrangement. The state's objective, of course, is to get better quality work which is somewhat harder to get in winter. But the state's pay-off is what the bids say. Bid prices are said to have been generally quite satisfactory in Texas, and cooperation on mutual problems should be a factor in keeping them so.—*H. J. McKeever.*

Peddlers' Menu

Hi-Test Cocktails
Crusher Run Relishes
Hemp Center Shrimp Clay Ball Salad
Concrete Crackers
Grader Blade Steak
with
Asphalt Sauce
Fine Grind Potatoes
Nitro Green Beans
Tandem Rolls
Low Penetration Butter
Compensation Pie with Bonded Cream
Strength Design Coffee
Borrow Pit Tea
A. S. T. M. Water High Gravity Milk

C. A. Hogentogler Leaves Field of Highway Research

IN a most fitting tribute to his long service to the Board, the May issue of the *Highway Research Abstracts* announced the retirement of Chester A. Hogentogler from the Public Roads Administration together with his resignation as Chairman of the Department of Soil Investigation of the Highway Research Board. However, Mr. Hogentogler has not relinquished his interest in the road builder, but feels instead that a still bigger job, that of promoting the use of research results in practice, provides a field of opportunity with boundaries too wide yet to be fully recognized.

It was primarily his work in soils that obtained for Mr. Hogentogler the Dudley Award from the American Society for Testing Materials in 1934; the George S. Bartlett Award from the American Association of State Highway Officials; the Highway Research Board and the American Road Builders' Association in 1937; membership in the Sigma Xi from the Rennselaer Polytechnic Institute in 1944; and his present status of an eminent authority on soil stabilization and soil mechanics from his professional colleagues the world over.

In his own opinion, however, it was his varied experience in the bituminous and concrete pavement fields, prior to his soils work, that equipped him to speak the language of qualified road builders, and it is to this faculty that he attributes his progress in the translation of research findings into practical working tools for use by the design, construction and maintenance engineers.

Upon his graduation from the Pennsylvania State College in 1909, Mr. Hogentogler entered the structural steel field and, while this work held his interest but a very short time, it did provide the fortunate opportunity for him to spend several months on the construction details of a proposed replacement for the great Quebec Bridge which had failed during its construction in 1907. Also it was his structural engineering experience which first took him to the city of Washington; where he came in 1910, to detail the steel frame work of the Continental Hotel on North Capitol Street.

Mr. Hogentogler's work in the highway field began with his employment by the Pennsylvania Department of Highways in 1911; and the next

C. A. Hogentogler

year he was elected municipal engineer of the Borough of Columbia, Pennsylvania. At the age of 25 he was then the youngest engineer to be placed in charge of the work of any municipality in that great state.

On the assumption of his duties there, he immediately established close contact with the tar and asphalt industries and, with their assistance spent the next seven years, intermittently, in the construction and maintenance of experimental bituminous pavement surfaces. From the very start of his activities in this period of flexible pavement development, success attended his efforts to such an extent that all of the pavements then constructed proved to be 100% skid-proof; and furthermore, after 30 some years of use, they are still rendering first-class service to the Borough of Columbia.

Mr. Hogentogler's first intimate contact with portland cement came with his introduction into the service of the U. S. Government in 1918. There, during World War I, he was assigned to the Cement Section of the Bureau of Standards; and during that period, this section, under the direction of the late J. C. Pearson, had charge of the testing of all the portland cements manufactured in the United States.

At the conclusion of this work in 1919, he was transferred to the U. S. Bureau of Public Roads where, under the supervision of Mr. A. T. Goldbeck of the Division of Tests, he was placed in charge of the investigation of pavement resistance to motor wheel impacts.

Here the principal problem was to determine the impact forces produced on experimental pavement sections, by a rubber-shod plunger, dropping from different heights. However, in Mr. Hogentogler's words, "a suggestion from the fertile mind of Mr. Goldbeck," led to a method of analyzing the plunger deceleration curves; and as a result the desired answers were provided within the next year. So, in 1920, he was assigned to the Illinois Department of Highways to represent the Bureau of Public Roads on the Bates Road Tests.

It was here that his association with Mr. Clemmer first began; an association which has since proven a marked asset in the field of highway research.

Here, also, it was that the impact force analysis method developed under Mr. Goldbeck's supervision was applied to moving truck wheels with the result that, in cooperation with Mr. Clemmer, he developed the first coil-spring accelerometer. Coincidentally, they devised the first road-roughness profilometer and in conjunction with Mr. A. C. Benkelman, then of the Illinois Department, made the first discovery of the curling or warping of rigid pavement slabs due to moisture content and temperature changes. It will be shown in subsequent articles that findings in the Bates Road Tests suggested also the development of Dr. Westergaard's coefficient of subgrade reaction, K; and substantiated, in the field, facts regarding the movement of capillary moisture in soils which were first found by C. M. Upham and H. F. Janda, in laboratory investigations.

At the conclusion of the Bates Road Tests in 1922, Mr. Hogentogler made a survey of the vitrified brick, rock-asphalt and lime rock roads in Florida and other southeastern states, and then was assigned to serve as assistant-director of the Highway Research Board under Dr. Wm. K. Hatt, its first director.

In 1923, the Society of Automotive Engineers, the U. S. Rubber Association and the Bureau of Public Roads began a cooperative attack on the effect of motor wheel impacts on pavement surfaces and, under Mr. Goldbeck's direction, Mr. Hogentogler was placed in charge of the project for the Bureau of Public Roads. Again, the prime requisite for the performance of the work, was a device which would record the force of the impacts delivered by different tire equipments on the various types of road surfaces; and the coil-spring accelerometer with further developments by Mr. Hogentogler was the one selected as best suited for the work. The principal result from this investigation was a decision by the rubber industry to dis-

(*Continued on page* 96)

Soil Stabilization, Subgrades and Subbases

(Condensed from a talk given before the Ohio Highway Engineering Conference by Harold Allen, Principal Materials Engineer, Division of Physical Research, Public Roads Administration, Washington, D. C.)

SUBGRADE and subbase material must resist volume change caused by moisture content fluctuation and must have mechanical stability to resist displacement under load. Many soils meet these requirements; some soils, by mixing with other soils or ingredients can be stabilized; and some soils are entirely unsatisfactory and must be well-covered with suitable material.

Fills or subgrades are compacted in order to obtain high stability and high resistance to subsequent volume change caused by further consolidation or changes in moisture content. Although no one moisture content and density will be permanently retained, the best resistance to moisture gain or loss occurs when pores are as nearly filled as possible.

If soil is compacted to maximum density at optimum moisture content, objectionable settlement will be reduced to a minimum and embankment slopes may be made steeper.

Use *local materials* and stabilize where necessary. A flexible surface, if added, offers no additional strength, but it does resist abrasion and prevent rainwater from reaching the subgrade except at shoulders. The base should always be compacted before surfacing.

Clay is a very poor base material. Soil-aggregate mixtures having a liquid limit greater than 25 or a plasticity index greater than 6 should never be directly covered by a watertight bituminous surface. Before the surface is added, capillary water in the clay rises and is evaporated. The surface, when added, stops this evaporation. Moisture accumulates around the clay particles. The wet clay has a low strength and acts as a lubricant for the granular particles. The soil is unstable.

Stabilization Methods

Strengths of fine-grained soils decrease with increases in volume and moisture content, and swell due to capillary wetting can be reduced by decreasing the plastic index. Hence, fine-grained soils or plastic soil-aggregate mixtures can be stabilized by combining with materials that will reduce the plastic index by physical or chemical changes. However, this procedure is limited to soils sufficiently friable for current construction machinery to pulverize. If liquid limit is greater than 40 and plasticity index is greater than 20, pulverization is too difficult. Such soils should be covered with granular materials or materials that can be pulverized for stabilization. Stabilization is accomplished by adding fine sand or other mineral aggregate, cement or lime.

The use of sand to reduce the plasticity index is seldom economical because as much as 70% of sand may be required to reduce the plasticity index from 15 or 20 to 10 or less. It is usually cheaper to cover the subgrade with an appreciable thickness of available sand. Plastic soil-aggregate with only 15%-30% passing the No. 40 sieve can be stabilized economically with fine sand. If used as a base course for a thin bituminous surface, the plasticity index should be reduced below 6 and grain sizes should be well-distributed.

Available experimental data show that a relatively small per cent of cement may have an appreciable effect on plasticity index of a soil. In general, the greater the per cent of cement, the greater the reduction in plasticity index, although the addition of 3% cement produced a greater change than any succeeding increment. However, the 3% cement content did not impart to any of the soils encountered the stability required for a satisfactory base course.

Results of tests in Texas indicate possibilities of use of lime in stabilization of plastic fine-grained soils. Tests have not been made to determine resistance of lime-soil mixtures to wetting and drying or freezing and thawing.

Asphalt Stabilization

Tars, emulsions and asphalts have been used in stabilization of soils without addition of granular materials. But, because of the large amount of bituminous materials needed with many raw soils, it is often more economical to add granular material retained on a 200-mesh sieve. Gradation of such granular material is not important and can often be obtained from waste piles. Baskin and McLeod of Canada found that 1%-2% of liquid asphalt reduced the water absorption of mechanically stable mixtures and thus tended to preserve the high bearing capacities such mixtures possess when dry. In southeastern and midwestern states cohesionless soils (sand dunes, etc.) have been stabilized with liquid bituminous materials. Proportioning methods and construction procedure are similar to those used in building densely graded bituminous surfaces.

●

Cities Get Vehicle Taxing Powers—The governor of New York state has signed a bill extending to cities of over 25,000 population the power to tax vehicles. Heretofore only cities over 100,000 had this authority.

Computing Water Flow

(*Continued from page* 87)

in D, E, or F, and having decided upon the velocity of flow, it is perfectly evident what to do.

(6) This chart can also be conveniently employed as a conversion chart. For example, how many gallons in 2.6 cu. ft.? The dotted horizontal line already drawn shows that the answer is about 19.5 gal., which is also equivalent to about 165 lb. of water. At the same time this chart gives a visual demonstration of the relationship between pipe sizes—standard, exact, and extra heavy. By using this chart one can quickly "read off" the internal diameter of a standard or extra heavy pipe.

The range of this chart is great enough to take care of almost any problems one may encounter. The standard pipe sizes range from ⅛" to 15" and the velocities from 0.3 to 30 ft. per second.

In the event that the liquid is other than water, multiply the weight of water by the density or specific gravity of the liquid and you then have the weight of the desired liquid. Thus, for example, if it is an oil having a specific gravity of 0.9 we would have in the above problem 165 x 0.9 — 148.5 lb. of oil.

And finally, should you prefer to use formulas rather than this chart either for solving the problem directly or for checking the results taken from the chart, here are the formulas on which the chart is based:

$$Q = 2.45\ d^2\ V$$

where Q = gallons per minute;
d = internal diameter of pipe, inches;
V = velocity of liquid, ft. per second.

Cu. ft. per min. $= 0.327\ d^2\ V$;
Lb. water per min. $= 20.4\ d^2\ V$.

★ Looking down through three levels of welded H-pile cribbing (Photos by C. R. Hanes, Ohio department of highways)

Earth Filled

- **Double-walled earth-filled cofferdams used for main channel piers; footing depth for one pier carried additional 30 in. down below cofferdam by drilling and blasting last 5 ft. under water and tremie concreting holes**

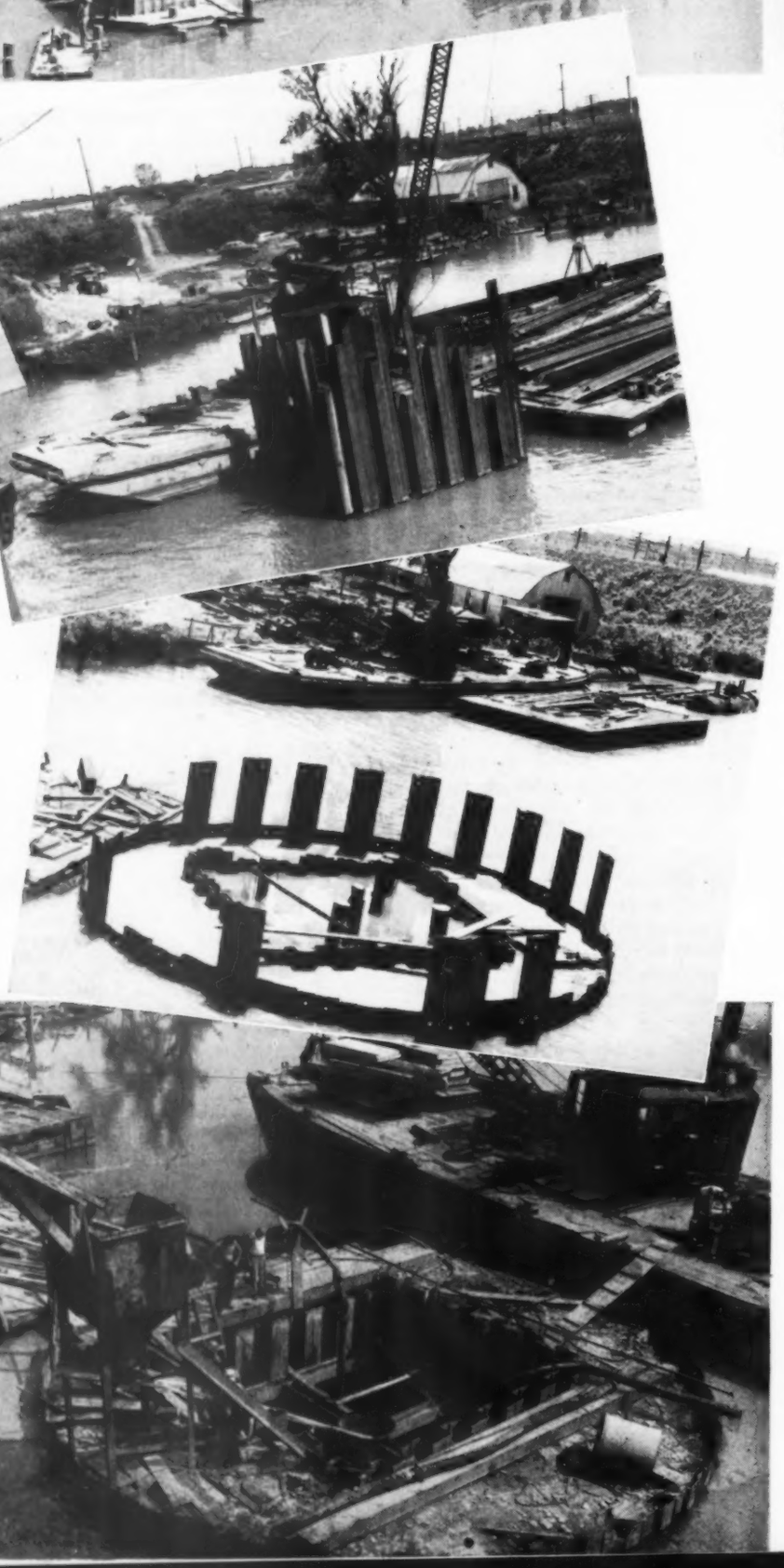
- **Approach pier footing holes power-bored through stiff clay**

PROJECT: New 4-lane arterial highway bridge on US 2 over Huron River, Erie County, Ohio. Part of 1947 Ohio state highway program.

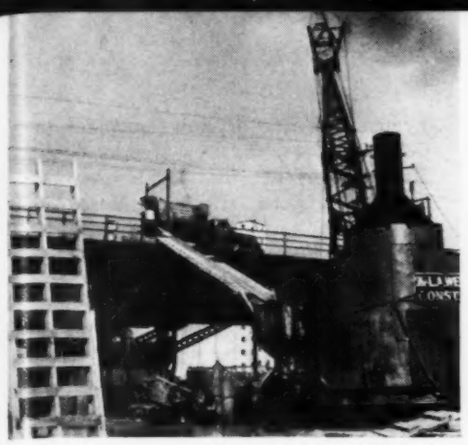
Contractor: C. B. Moon, Cleveland, was the successful bidder, taking job at $1,360,770. Caisson and other foundation work was sublet to L. A. Wells of Cleveland.

Bridge Consisted of: 120-ft. deck girder mid-channel span, two side-channel girder spans each 86 ft., and a total of 20 ft., concrete slab approach spans. Total length of bridge, 1,021 ft.

Chief problem was the necessity of going down fifty feet or more to rock through stiff clay. Armed with thorough test boring data, the bridge's engineers in the department of highways decided upon use of two shafts to rock for each of the four river piers, and



★ Step-by-step scenes during construction of double-walled cofferdam: Temporary wood piles and working platform in place; Inner sheeting being driven; Both sheeting walls completed; Hole de-watered and tremie concrete being placed from hopper at left



★ Concrete for entire job was delivered by truck mixer; considerable chuting involved

★ One river pier completed, forms under construction for another. Light falsework employed in conjunction with floating equipment

Cofferdam Bored Approach Footings

employed on Ohio highway bridge

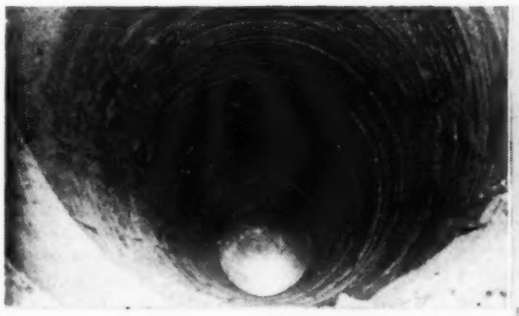
three-column construction to rock for approach span bents, the bents widening to comprise four columns near approach ends where the roadway is widened for a curve.

The two mid-channel piers were designed sufficiently heavy to support a future 120-ft. lift span.

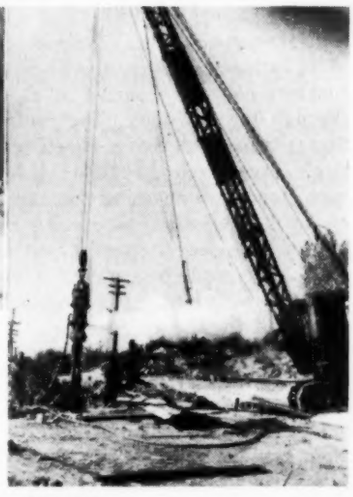
Main River Piers

The river piers had to be taken down to a depth of 50 ft. Open cofferdams were constructed consisting of a rectangular crib of steel sheeting and an outside circle of sheeting, earth-filled between. Crib bracing consisted of three frames of welded H-beams and I-Beams. All pile driving, clamshell work, pile extracting and handling work were performed by a steam crane from a barge.

Foundation plans for the first river pier built required the contractor, on reaching hard shale bottom, to drill a test hole on down to double-check on the presence of solid rock. This exploration revealed mud seams, so the contractor was required to carry the footing down another 30 in. Since sheeting had already been driven as far as possible into the hard shale, and bottom of sheeting was still about 18 in. above the revised footing elevation —and since excessive water was anticipated—the contractor was apparently in somewhat of a fix. However, his



★ The stiff clay was ideal material for use of auger. Here is a completed hole for an approach pier footing, ready for setting steel sheeting as liner



★ After sheeted hole was concreted, sheeting was pulled by a pile extractor

★ Power-driven rig, with 54-in. auger, as used for approach footings

judgment and experience came to the rescue. He proposed and was granted an OK on the procedure of lowing the entire cofferdam by the following method:

1. Let the cofferdam fill with water. 2. By use of divers, drill holes some 30 in. into the foundation material on 4-ft. ctrs. and load with explosive. Explode center holes first, followed by holes which define the perimeter of the foundation. 3. Remove loosened material by clamshell. 4. Use divers to clean up, inspect and measure new lowered footing hole thus created. 5. Tremie concrete into the area thus excavated, and also carry concrete by tremie on up to 2½ ft. above the original planned elevation of footing top. Total thickness of seal was about 5 ft. This method proved entirely successful, and probably saved considerable time and money over any feasible method involving de-watering or lowering the entire cofferdam.

The footing and the seal, being separately poured, had to be keyed, and this was done by the very practical and satisfactory method of sinking several sand-filled 50-gal. oil drums half depth in the footing pour.

Power Auger for Approach Footings

The approach piers involved a total of 60 cylindrical 36-in. and 54-in. diam. concrete columns, carried 50 ft. down through the stiff clay. The contractor first planned to drive sheeting in a circle, excavate and set the reinforcing cage, then pull sheeting for each hole on the day following concreting. Sheeting of this length proved extremely difficult to pull, in spite of a special A-frame with heavy 100-ton block and falls built for the purpose.

A special power cutting auger, operated on a 60-ft. shaft supported by an A-frame extension on the crane, had been devised for reaming out the hole after driving the sheeting. It was soon found that the clay was so dry and stiff that the hole could be bored safely to nearly full footing depth in advance of setting sheeting. This was done throughout the remainder of the job. The practice was to bore to rock, set the sheeting as a liner for the hole, driving sheeting a short distance to secure footing anchorage in hardpan, backfill immediately along bottom of sheeting with screenings, then put a man down to drill and hand-excavate about 4 ft. into rock. The steel cage was then set and the column cast using a tremie pipe with flared top, concrete being supplied from ready-mix trucks via chute or concrete drop bucket and crane.

Sheeting proved quite easy to pull with a steam pile extractor, the ease of pulling apparently being due to the fact that the pile pressure against the outer clay, developed during concreting, was much less than the pressure developed by driving before excavating.

C. A. Hogentogler Leaves Field of Highway Research

(*Continued from page* 92)

continue the further use of solid rubber tires.

On Mr. C. M. Upham's assumption of the Directorship of the Highway Research Board in 1924, he was asked by the industry to inaugurate an investigation which would settle once and for all the question of whether or not the use of steel reinforcement in concrete roads was economically justified. Mr. Hogentogler was granted leave of absence by Public Roads in order to carry on this investigation.

Regarding this work the following is quoted from material published by the late R. D. Bradbury:

"The most significant data and conclusions establishing the relative merits of plain and reinforced concrete roads by direct detailed comparison are undoubtedly those embodied in the Report of the 'Investigation of the Economic Value of Reinforcement in Concrete Roads' as presented by C. A. Hogentogler at the Fifth Annual Meeting of the Highway Research Board. Unlike all previous investigations of similar nature, each of which accounted for merely local conditions, this investigation was nation-wide in scope, involving as it did inspection of some 5,000 miles of highways, both plain and reinforced, about 2,000 miles of which were subjected to detailed study and analysis. This mileage, distributed through 26 states, included thicknesses of 5 to 10½ inches; ages of from 1 to 13 years; sub-grades ranging from stable sands to clay causing a 9-inch heave; traffic between minimum and maximum limits; and reinforcement ranging from light wire fencing to ⅞ inch bar mats."

The investigation required 18 months to complete and furnished 14 conclusions which left no further doubt about the advantages to be gained by including steel reinforcement in concrete pavements and pavement bases.

It was with this background, supplemented by teaching experience at both the Pennsylvania State College and the University of Idaho, that Mr. Hogentogler entered the field of soil research in 1926. He now plans to review those early researches which have left a conspicuous mark on current road design, as the best approach to narrowing the gap which seems to have developed between the research and the construction fields.

See You in Chicago!

Average State Gas Tax—The average state gasoline tax per gallon for all states was 4.25 cents in 1947, as compared with an average tax of 4.16 ct. in 1946. State gasoline tax rates last year ranged from 2 ct. a gallon in Missouri to 7 cents a gallon in Florida, Louisiana and Tennessee. The Federal tax is 1½ ct. a gallon.

★ Looking down a footing hole after sheeting in place

★ Project as seen looking toward river, with several approach bents and abutment poured and sheeting being set for a river pier

Some Facts About Wire Rope

Here is an excellent summary of "what everyone should know" about wire rope: the various types and their special advantages, and importance of regular lubrication, inspection and general care

WIRE rope is one of our most reliable structural materials because it is a precision product. It is fabricated of carefully selected steel wires that have been cold drawn to extremely close tolerances and made to meet rigid physical and chemical requirements.

Contrary to a belief held by many of its users, wire rope is not a product that is easily and quickly fabricated by taking a bunch of wires and twisting them into strands, and then twisting these strands into a rope. It is made of a definite number of wires of the correct size and these are laid together—not twisted—to form a pattern known as a strand. A certain number of similar strands are then laid together around a core or center to form the finished rope. Care must be exercised, of course, during the manufacturing process to lay the wires in the strands and the strands in the rope to the correct pitch or lay, and to employ a core of the right diameter, if the finished rope is to operate to the best advantage in service.

Types of Wire Rope

Wire rope is manufactured in several different grades, and each of these can be furnished in many different constructions. Generally speaking, there are four standard constructions —the 6 x 7, the 6 x 19, the 8 x 19 and the 6 x 37—and the number and relative size of the wires determine the degree of flexibility which is imparted to the rope.

The first number in each case applies to the number of strands in the rope and the second to the approximate number of wires in each strand. For instance, the 6 x 7 rope has 6 strands, each of which is made with seven wires.

Of course, there are many other constructions of wire rope besides the ones described here, and there are also several different constructions which fall under each of the four standard classifications. For example, 6-strand ropes with from 16 to 25 wires in each strand fall under the 6 x 19 classification. Therefore, a 6 x 19 rope actually could have 19, 21 or 25 wires in each strand, depending on the duty for which it is to be used. Likewise, 6-strand ropes with from 26 to 46 wires in each strand fall into the 6 x 37 classification, and the specific application for which it is intended will determine the most effective strand arrangement.

The 6 x 7 construction, fabricated of six strands of seven wires each and a fiber core, is often referred to as a "coarse laid" construction. It is used to advantage where abrasive or corrosive conditions are quite severe and where the size of the sheaves and drums over which it operates are so liberal that bending is of little consequence.

The 6 x 19 construction is fabricated of more but smaller sized wires, and as a result this makes a much more flexible type of rope. It can withstand bending to much better advantage than a 6 x 7 rope, but still is well able to resist abrasion or scrubbing types of abuse. Probably more of this type of

★ For each rope service, there is a proper size and type of wire rope, and a routine for making that rope gives longest service

rope is employed for general hoisting purposes than any other, because it lends itself more readily to a multiplicity of uses.

The 8 x 19 and 6 x 37 ropes are, in the order given, the most flexible and the least abrasion resistant of the standard rope constructions. These ropes are employed where limited sheave or drum diameters or the number of sheaves over which the rope is reeved demand a very pliable construction. Due to the relatively small wires of which they are fabricated, they are not well suited to conditions where severe abrasion or corrosion is of major importance.

The 8 x 19 construction is often used on elevators. It is sometimes used on traveling cranes, but, in general, the 6 x 37 construction is much more satisfactory for this service. In the smaller sizes, this represents the most common application for 6 x 37 ropes in the industrial field.

In the larger sizes the 6 x 37 construction is used on stripping shovels in the Mid-Western coal fields. Another application for the 6 x 37 construction is on the larger dredges.

Wire Rope Cores

In general, wire rope cores are of three types . . . fiber, an independent wire rope or wire strand. Each type serves the same basic purpose, that of affording support to the strands laid around it. A fiber core applies to any fibrous material that is woven into a rope of its own, while an independent wire rope core or a wire strand core is composed of wires.

Fiber cores are adequate for most types of service, because they not only provide the necessary foundation but also add to the flexibility and elasticity of a wire rope.

On many installations conditions are such that a fiber core is inadequate, and in these cases a metallic core must be used. For types of service where high operating pressures are encountered, or in cases where resistance to heat, additional strength or minimum stretch is a prerequisite, either an independent wire rope or a wire strand core generally is recommended. It is suggested that either of these two types be used only upon the advice of the rope manufacturer.

Regular and Lang Lay Ropes

The 6 x 7, 6 x 19, and 6 x 37 ropes are sometimes fabricated in the so-called Lang Lay construction. In the Regular Lay construction the wires are laid in the strands opposite to the direction in which the strands are laid in the rope. As a result, the individual wires on the outside of the rope are approximately parallel to the axis of the rope.

In the Lang Lay construction the wires are laid in the same direction of the lay of the strands and thus the wires make a considerable angle with the rope axis. The Lang Lay rope has the same strength as the Regular Lay and it has the advantage of being slightly more flexible for the same size and strand construction.

The Lang Lay construction also has the advantage of offering greater resistance to abrasion. This is because of the longer length of each outside wire exposed to wear. The Lang Lay construction, however, is a little more susceptible to damage during installation, and it generally needs more care in its operation.

During the last few years, improvements in the fabrication of Lang Lay ropes have been made so that it is becoming more and more possible to increase rope service by making use of the inherent advantages of Lang Lay ropes on installations which previously required the use of the Regular Lay construction.

Preformed Wire Rope

Preformed wire rope is made of the same material as the standard type of rope, and, therefore, can be furnished in any size, grade, and construction, and in either Regular Lay or Lang Lay.

Preformed wire rope is fabricated in the same manner as standard rope, except that during the final operation the wires and the strands are formed to the spiral shape they must assume in the finished rope. Due to this, the strands do not have a tendency to unlay when the rope is cut, and this inert characteristic is what makes a preformed rope readily distinguishable from one of standard construction. The tendency not to unlay makes preformed rope less susceptible to some forms of abuse and less likely to be damaged during installation.

Preformed rope is also a little more flexible than standard rope of the same size and construction, and it is for this reason that better service can be obtained by employing it in cases where bending conditions and fatiguing stresses are particularly severe. For instance, it is generally used today on excavating machines, on some elevators where the sheave sizes or manner in which the rope is reeved subjects it to a fairly severe bending condition, and also in many cases where the ropes are subject to considerable handling and protruding wire breaks might present a safety hazard.

There is another difference between standard and preformed rope that becomes evident after the rope has been in service for some time. This is that broken wires are not so easily detected in the preformed as they are in the standard type of rope. Because the strands and the wires have been shaped to their spiral forms, it is understandable why, when a wire break occurs, the broken ends remain in their original positions and do not spring up from the surface as they do on ropes of standard construction. Due to this characteristic, it is generally difficult or impossible to locate broken wires in a preformed rope by running one's hand, a piece of cloth, or waste along it.

It has been found that the best way to examine a preformed rope is to use a good light and to inspect it visually, making no attempt to wipe it first, since this only tends to smear grease over the worn crowns. If these crowns are not touched, the ruptures can be seen at the points where contact with the sheave and drum grooves normally keeps the wire entirely free of lubricant.

This does not mean that the inspection of preformed rope is too difficult to be accomplished with accuracy. It should merely be pointed out that there is a difference between the two types of rope and a somewhat different procedure may have to be followed when inspecting preformed rope if its true condition is to be accurately determined.

Wire Rope Lubrication

There are many factors that could be mentioned in regard to the installation and maintenance of wire rope. However, these points are continually stressed by wire rope manufacturers and are familiar to those who handle the product. This part of the story can be omitted, therefore, with the exception of one very important factor . . . the lubrication of wire rope.

All wire rope is lubricated at the time it is made, but this lubricant cannot last the entire life of the rope, since weather exposures and the kneading action of the rope as it passes over sheaves and drums tend to wash away and squeeze out this original lubricant. Replenishing the lubricant therefore is necessary, not only to protect the rope and prevent the development of corrosion, but to keep the individual wires well oiled so that friction is kept to a minimum.

A wire rope is a flexible member because the many parts of which it is composed can move with respect to each other as the rope operates around a drum or over a sheave. When this movement can take place with the least amount of friction, internal wear of the component parts and the development of fatigue are reduced to a minimum, and, of course, both of these

(*Continued on page* 101)

(*Continued from page* 98)

factors enhance the life and safety of the rope.

In some cases where corrosive agents have penetrated the rope, corrosion may cause considerable damage without being very much in evidence on the surface. Any pronounced reduction in rope diameter which cannot be explained by normal wear and usage should be regarded with suspicion, since it may indicate the presence of internal corrosion.

Evidence of Corrosion

This reduction in diameter of one section of the rope in comparison to another section is often the only evidence of internal corrosion. Except by careful measurements of the rope, corrosion of this type may be impossible to detect, and it represents a dangerous condition which usually could have been avoided through a proper lubricating practice.

Lubricants of practically any consistency, ranging from fairly thin oils to heavy almost tar-like substances, can be obtained. Whatever material is used, however, must be free from any element which might attack the constituent parts of the rope, and it must be chemically neutral.

Where severe corrosive or wet conditions are encountered, a fairly heavy compound which acts as a protector oftentimes can be used to good advantage. To apply this properly, it must be heated so that it will penetrate as effectively as possible and so that it will adhere to the surface and protect the rope externally.

Somewhat lighter lubricants which have better penetrating properties may be used for average conditions where some protection against corrosion is needed, but where a material having more lubricating value is required. Some lubricants for installations in this class can be applied cold, but more satisfactory results generally will be obtained if a little heavier material, applied in the heated state, is used. In this way, better penetration and longer protection to the rope will result.

On still other types of equipment, thinner lubricants that will properly penetrate without being heated, can be employed. Ropes on plant cranes and elevators can generally be treated in this manner, since they are operated indoors where corrosive conditions are seldom encountered.

Inspection in Service

One of the primary reasons wire rope is such a reliable member derives from the fact that it can be inspected while it is in service, and the development of wear and broken wires, which finally necessitate its replacement, can be watched. There are many ways in which these two factors, that is, abrasion and broken wires, can be measured to judge the condition of the rope, and inspectors who have been working with wire rope for years have devised reliable inspection practices of their own.

Such methods generally represent a means for estimating the remaining metallic area or remaining strength of a rope. After this has been done and it has been determined how far the factor of safety has been reduced due to deterioration of the rope, it can be decided whether or not the rope can be operated with safety for a longer period of time.

Important to Understand

On most installations where wire rope is used a considerable amount of damage can result if a rope failure occurs, and on some installations such an accident would result in loss of life. Therefore, it is important for those who use wire rope to understand it thoroughly, to handle and install it properly, and, while it is in service, to give it the care necessary to make sure it wears in a normal manner. When this is done, wire rope can be depended upon to give uniform service, to show, through wear and broken wires, what its condition is, and to give ample warning when the point is reached for its removal from service.

●

State Has $8,992,562 Equipment Inventory—The Division of Highway of State Department of Public Works of California had an equipment inventory of $8,992,562, according to the annual report of the department, Jan. 1948.

●

Offers Technical Librarian Course

Scientific and technical librarianship will be offered as an option in the Carnegie Library School of the Carnegie Institute of Technology, Pittsburgh, Pa., in 1948. This is the first time a library school has ever offered such an option. Designed to serve the needs of the several thousand special and industrial libraries over the nation, the new program will cover the use of scientific and technical reference works and administrative problems in special libraries.

The specialized courses scheduled to be given in the 1948-49 term include "Bibliography of Science and Technology" and "Administration of Science and Technology Libraries." An investigative or survey problem in some subject related to technical librarianship will also be included in the curriculum.

The program is a one-year graduate course leading to a Master of Library Service degree. Dr. Ralph Munn is director Carnegie Library School.

●

Business boomed this past winter for the New Jersey state highway department free towing jeep on the Newark-Jersey City Pulaski Skyway. In February the rescue crews gave aid to 355 stranded automobilists. The emergencies were: 129 flat tires, 206 mechanical failures, 2 out of gasoline, 6 accidents, 12 miscellaneous.

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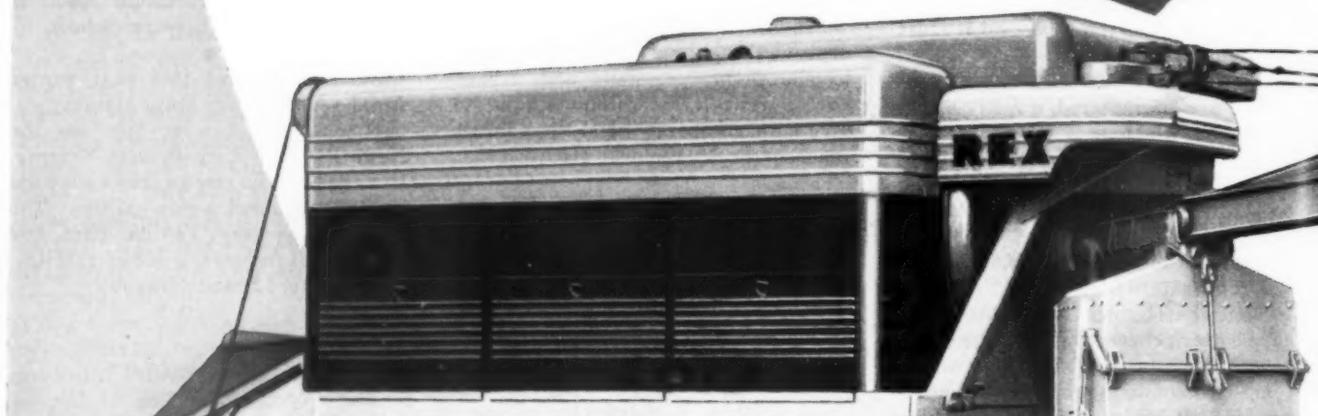
as new inside



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AND NEW simplicity of design, new rugged construction, new ease of spreading, new type crawlers... there's a whole host of new features it will pay you to check. For all the facts, see your Rex Distributor or write Chain Belt Company, 1685 W. Bruce St., Milwaukee 4, Wis.

CONSTRUCTION MACHINERY

★ Scenes in the central machine shop at Portland, Conn. Milling a pump impeller for an oil distributor department's machine shop

How They Keep 'em Rolling in Connecticut

Eleven garages, machine shop, keep state's 1600 highway maintenance equipment units in running order

EVERY state highway department has had to work out its own system of equipment repair and maintenance. Connecticut, being a small state geographically but not in miles of road maintained, has found need for eleven district maintenance garages. These are so located that they can care for most equipment needs within a working radius of 25 miles or less. A machine shop, located at Portland, is set up for the more serious repair work which justifies longer travel-in, according to the department's employee bulletin, which also issued the following data.

Maintaining nearly one-third of Connecticut's 14,000 miles of public roads and streets accounts for a substantial part of the work of the department. To carry out its maintenance responsibilities the department now has a complement of 180 passenger cars, 700 trucks, 17 oil distributors, 9 trucks with eductors, 9 graders, 2 power shovels, 12 road rollers, 36 water pumps, 30 concrete mixers, 7 compressors, 3 Calyx drills, 60 power mowers, 8 power sprayers, 100 loaders, 400 sand spreaders, 3 mud jack pumps and 36 tractor-type mowers.

Shops Well Equipped

To keep this equipment functioning and in good repair, each repair shop is equipped with lathes, power hack saws, a drill press, power grinder, 60-ton press, forge, arc welder, acetylene welder, valve refacer, valve reseaters, reamers, 12-ton floor jacks, special pullers, special jacks, and special automotive tools. In addition, each shop is furnished with tool boxes containing the common miscellaneous hand tools. The tools are in the custody of Storekeepers who dole them out to the repair personnel under the "tool-check" system.

The inspection of all department equipment and property, except Real property, is the responsibility of the Equipment Inspection Section. Under supervision of the Superintendent of Property, the section includes two Senior Equipment Inspectors and two Equipment Inspectors. These latter have general supervision of the activities of the repair shops and garages, to which they make periodic visits. They assist the Garage Foremen in the performance of their duties and aid them in the procurement of repair parts. The Inspectors also make regular inspections of all equipment.

How Organized

The garage foremen, working under the supervision of the Inspectors, direct the work of the mechanics, watchmen and other personnel assigned to them. They direct the maintenance and repair of all equipment within the area under their jurisdiction.

Prior to April 1 of each year, the Senior Equipment Inspector investigates the mechanical condition of each piece of snow removal and ice control equipment, and prepares a schedule of such equipment in need of a major overhaul. Beginning on April 1st, this equipment is sent to the repair shops as directed, so that all required repairs may be concluded by the following November 1st.

Removal of equipment from service is arranged cooperatively between the Senior Equipment Inspector and the Head of the using Unit. No more than 15% of the truck equipment is expected to be out of service for major overhaul at any one time. Each Bureau Head is required to schedule the work of his bureau so that the

The smoothly coordinated action of Bucyrus-Erie shovels makes digging a rhythmic dig-swing-dump routine that quickly piles up big output. Behind this precision blending of operating functions is responsive, full-feel control that practically "puts the load in the operator's hand."

Whether he is swinging, crowding, hoisting, or propelling . . . whether he is just starting the shift or finishing up . . . the operator gets exactly the power response he wants. The big cool-running clutches are self-adjusting for temperature variations, respond to lever action with a softness that eliminates jerks. The large brakes have high holding power, yet pedal pressures are low. Operating levers are long enough for plenty of feel, short enough for easy operation; a given pressure always effects the same response. Levers are conveniently arranged, too, so that the operator finds them all within easy reach.

These are a few of the reasons why operators of Bucyrus-Erie ⅜- to 2½-cu. yd. excavators can maintain a high-speed clip all through the shift, regardless of front-end type. See your Bucyrus-Erie distributor for more details about the control that gives these machines a head start in any kind of digging. And don't fail to ask about their easy convertibility for operation as shovel, dragline, crane or clamshell.

102E47

BUCYRUS-ERIE COMPANY
SOUTH MILWAUKEE, WISCONSIN

removal of this equipment from service will not interfere with the bureau activities.

Between November 1 and April 1 of the ensuing year, all other equipment is made available for general overhaul when and as directed by the Senior Equipment Inspector. The Inspector also has authority to order a piece of equipment out of service at any time if he believes that its continued use is either dangerous or detrimental.

Periodic Inspection

Each Highway Department truck is inspected periodically at a department garage. These inspections are reported on suitable forms at 1,000 and 5,000-mile intervals. Check-ups on new trucks are made as soon as possible after delivery and before such equipment is put into regular service.

The primary function of the Garage Maintenance Groups is the maintenance and repair of equipment. All routine work of this nature is performed as soon as the time and facilities become available for each project. Work of an unusual or special nature, such as structural changes, modifications of equipment, or experimental work, is not considered maintenance or repair work. It is not undertaken except by direction of the Superintendent of Property.

The accompanying floor plan has been adopted by the department as standard for a repair shop and stock room. The plan may be altered with respect to the size of the building to meet specific needs.

In addition to present facilities, a new repair shop is being built in Norwalk and four new garage and storage structures at other locations are substantially finished. The proposed repair shop in Winsted is expected to be built under private contract for department rental and optional future purchase.

★ Truck repairs in progress at one of the eleven garages

Minnesota Accent on County Roads

Minnesota's legislative interim highway committee has endorsed a proposal that would split gasoline tax revenues equally between the states and the counties. The 50-50 split, which is on the November ballot in the form of an amendment to the state constitution, would replace the present system under which the counties get one-third of the revenues. The commission said that if the amendment is adopted, a 1-cent gas tax increase will be necessary to partly replace state road revenues. It also saw the possibility of increased registration fees. The commission contends the best interests of the people will be served if the trunk highway system is not expanded and the counties retain and improve their main roads.

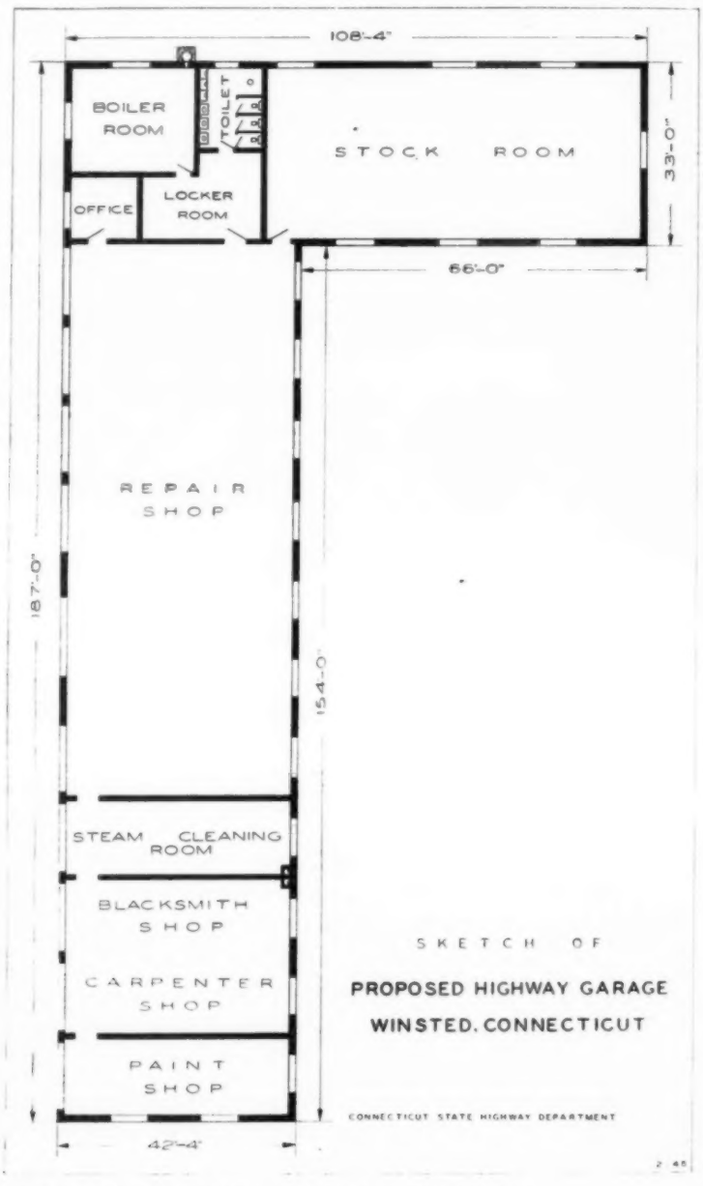
46 Miles Subsurface Drains Installed in Connecticut

(*Continued from page* 76)

and the state benefit by this arrangement under which over 5500 ft. of culverts were laid in 1947.

In the same year over 5,000 ft. of pipe was installed to replace old and broken down culverts and 25,700 ft. of new installations were made.

Experiments to eliminate pavement frost heave continue, included in which is the removal of faulty base material and replacement with clean, bank-run gravel drained to the outer face of the embankment if in fill or to a foundation underdrain if in cut.



★ Proposed additional shop, designed to a standard plan which can be made to selected dimensions to meet capacity needs

THE PAST *Performance* OF LIMA CRANES and EXCAVATORS

IS A *Safe Guide* TO FOLLOW WHEN BUYING NEW EQUIPMENT

LIMA HAMILTON CORPORATION

LIMA owners have found that the past performance of their LIMA shovel, crane or dragline is a safe guide to follow when buying new crane or excavator equipment. They have experienced in LIMA, a new rugged digging power unhampered by long gear trains or conventional type bearings. LIMA "precision" air control has given them a new conception of ease of operation that is not found in ordinary machines. They also appreciate the ease of convertibility when a variety of jobs are to be done and the big output that results from fast digging cycles. These advantages plus adequate parts and service facilities in all parts of the country have made LIMA shovels, cranes and draglines first choice with experienced users everywhere.

LIMA SHOVEL AND CRANE DIVISION
LIMA-HAMILTON CORPORATION
LIMA, OHIO, U.S.A.

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LIMA, OHIO
Lima Locomotive Works Division
Lima Shovel and Crane Division

HAMILTON, OHIO
Hooven, Owens, Rentschler Co.
Niles Tool Works Co.

New Construction Equipment and Materials

1
New Motor Grader

The new BD, the latest addition to the Motorgrader line of the Tractor Division, Allis-Chalmers Manufacturing Co., Milwaukee, Wis., is a 50 H.P. machine having six speeds forward, ranging from 1.30 mph. to 14.69 mph., and three reverse speeds ranging from 1.55 mph. to 5.41 mph. The new BD has the tubular frame design which

Allis-Chalmers BD Grader

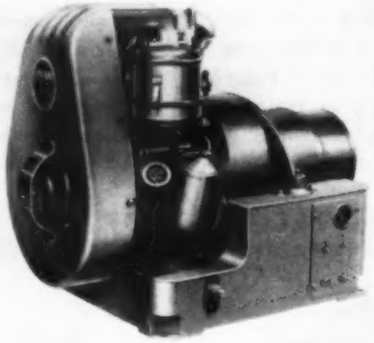
has proved so successful on the heavy-duty AD grader. Another Allis-Chalmers design featured on the BD and made popular on the larger AD grader, is the "Roll-Away" moldboard. Blade maneuverability on the new BD offers operators the extensive blade range required to suit a variety of jobs. A 28-in. clearance from the cutting edge of the blade to the circle enables the BD to accommodate the capacity loads that pass through the 22-in. axle clearance without disturbing the rolling action of the load. Precision adjustment of the blade from the operator platform facilitates bank cutting, handling of big windrows wasting dirt up banks and enables the operator to work exactly to specification with a minimum of effort.

2
New Electrode

A new all-position arc welding electrode, the Wilson No. 109, for welding of mild steel has been announced by Wilson Welder & Metals Co., Inc., New York, N.Y. This electrode, available in ⅛ in., 5/32 in, 3/16 in., 7/32 in., ¼ in., and 5/16 in. diameters, was developed to fill a definite need by industry for an electrode of the E6012 class with its special characteristics. According to the manufacturer, the new Wilson No. 109 electrode maintains a high degree of welding performance throughout the entire length of the electrode when high welding currents are used. Operation is stated to be most satisfactory in all positions, especially when welding vertically down.

3
New Diesel Electric Plants

Two new lines of diesel electric plants, air-cooled and water-cooled, completely equipped and self-contained, have been developed by D. W. Onan & Sons, Inc., Minneapolis, Minn. The new Onan DSP air-cooled diesel engine is the prime mover for Model 205DSP, 2,500 watt electric plant. The air-cooled plants are available in alternating-current models of 2500 watt capacities, 60-cycle, and



13 New Onan Diesel Electric Plant

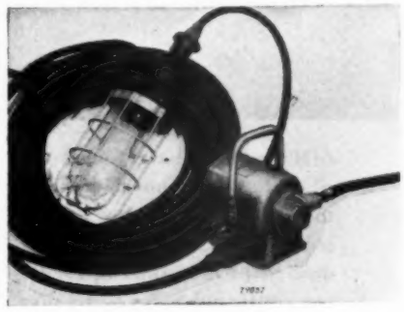
voltages of 115 or 230, single-phase, or 115/230-volt, single-phase, three-wire, or 230-volt, three-phase, three-wire. Onan water-cooled diesel electric plants, in 10,000 to 35,000 watt capacities, are powered by heavy-duty Buda diesel engines. They are enclosed in weather-proof, sheet-steel housings with removable side-panels for easy servicing. The welded base is made of heavy structural steel. Water-cooled models are available in capacities ranging from 10,000 to 35,000 watts, alternating current, in 60-cycle, single and three-phase, all standard voltages; also available in 50-cycle.

Mail Inserted Card

For data on equipment described on these pages. See also inquiry blank on page 132.

4
Air-Powered Generator

A light, air-powered generator, announced by Ingersoll-Rand Co., New York, N.Y., uses compressed air to provide light for construction, shaft sinking, mining and quarrying. The



AL-150 Airlite

outfit will provide ample power to operate two 75-watt, 115 volt bulbs. The unit weighs 8¾ lb. and measures 7¼ in. x 5 in. x 5 in. without handle. Both 115 volt and 220 volt models are available.

5
New Materials Handling Unit

A new materials handling device having a capacity of 1000 lb. and ability to climb a 20% grade with full load, is now in production by Bell Aircraft Corporation, Buffalo, N.Y. Called the Prime Mover, the machine has three wheels, is power operated

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and can be equipped with a bucket or a steel and wood platform deck. A snow plow attachment is also available. The Prime Mover has a 3 h.p. air-cooled engine and is stated to operate for eight hours on 3 gal. of fuel. Transmission, clutch and gears are completely enclosed and no belts or chains are used to transmit power from the engine. The bucket has a

Bell Prime Mover

capacity of 10 cu. ft. and the addition of sideboards raises the capacity as high as 18 cu. ft. for lighter materials. The bucket is quickly interchangeable with the platform deck, without use of tools. Both the platform and the bucket dump automatically, and then return to a level locked position. Weighing slightly more than 400 lb., the Prime Mover is 35 in. high, 63 in. long and 31½ in. wide. It turns in its own radius.

6
Improved Transit-Level

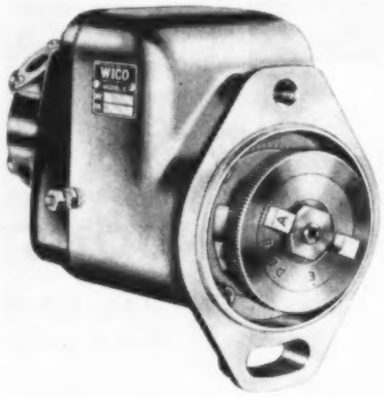
Ten new improvements have been incorporated recently in the Model 3000 Universal transit-level of David White Co., Milwaukee, Wis. This instrument is designed especially for building and construction work and all survey and check-up operations on

White Improved Transit-Level

building and road construction. The modifications include the following: The vertical arc has been increased from 3 to 4 in., with vernier reading to five minutes. The telescope axle now has a permanent bearing hold-down adjustment. Perfect operation under the most severe conditions of heat and cold is insured by a solid spindle with tapered end thrust in the ball bearing race. A special adjustment has been added to the lock levers for locking the instrument in the level position. Large shifting base, or center, permits shifting of the instrument ⅞ in. over a given point without moving the tripod. The clamp and slow motion (tangent) screws provide both horizontal and vertical motion for fine adjustment. Sensitive level vials are placed under the telescope and in the instrument base, the latter for use when the telescope is in the transit position.

7
Adjustable Coupling for Magnetos

An adjustable coupling for flange-mounted magnetos is now available on certain models made by the Wico Electric Co., West Springfield, Mass. This important advance in magneto design is valuable because of the many variations in magneto drive lug locations in relation to advance spark timing on tractors and engines of different makes. This new development provides an impulse coupling



Wico Magneto with Adjustable Coupling

with an adjustable lug plate that can be set to any position required by any engine application. There are two models of four-cylinder S.A.E. flange mounted magnetos equipped with these adjustable lug plates: the XH2500 which rotates clockwise, and the XH3000 which rotates counter-clockwise. A knurled lock nut, with two set screws and a tool hole, tightens around the lug plate. On the lug plate are five marked positions, lettered A through E, and providing five different lag angles at which the lugs can be set. Through this new adjustable lug plate, magneto replacements can be made on 68 different models made by eleven different engine manufacturers with just the two different magneto models.

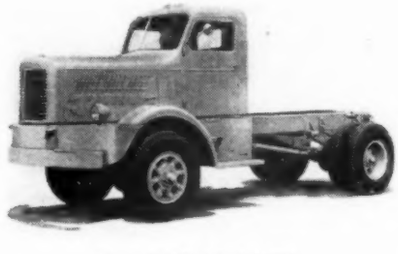
8
New Concrete Breaker

A new medium-weight concrete breaker, the Model B67 has been announced by Gardner-Denver Co., Quincy, Ill. The new breaker, which is a companion to the heavier Model B87, is built for general demolition work where the heavier breaker is not required. The Model B67 is claimed to be especially suitable for horizontal operation, such as tearing out walls, for boulder breaking in quarries or mines, for trenching in shale or hardpan, or for preparing black-top for patching. Weighing 63 lb., it has an over-all length of 23 in. and can be fitted with chucks for either 1⅛ in. or 1¼ in. hexagon tools.

Model B67 Concrete Breaker

9
New Model FWD Truck

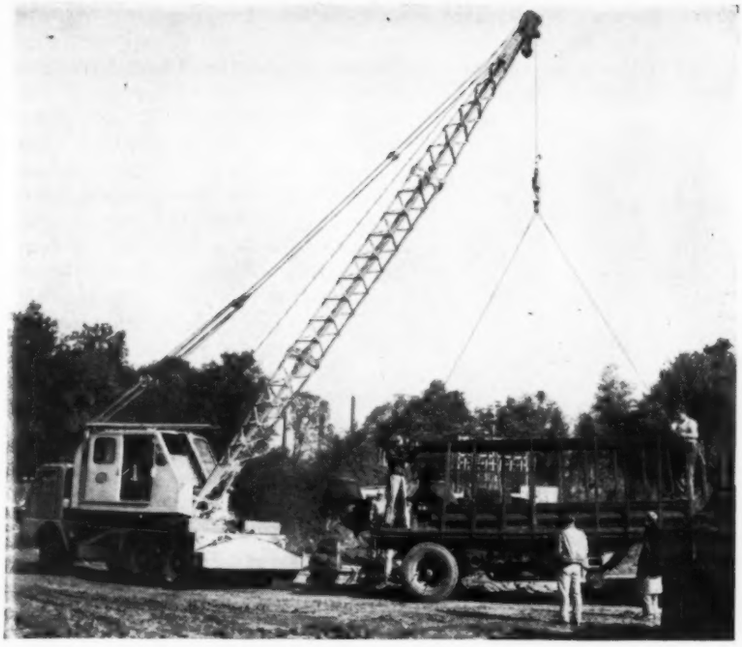
A new model in its line of heavy-duty four and six-wheel-drive trucks has been announced by The Four Wheel Drive Auto Co., Clintonville, Wis. Rated at 33,000 lb. gross vehicle weight, the truck is newly designed and newly engineered throughout. Embodied in the new model are entirely new features in advanced automotive engineering and design. The new model is the first in the FWD line to feature the new FWD all steel cab, which provides 30% greater visibility and increased driver comfort.



New FWD Model ZU

The frame of the new model is a 10" x 3" x 11/32" heat treated channel steel with welded and reinforced front cross-member providing a strength factor more than 200% stronger than any previous FWD model, a distinct advantage in snow plow operations. Engine supports, transmission supports, cross-members, spring brackets, etc., are all of fabricated construction providing greater strength and rigidity.

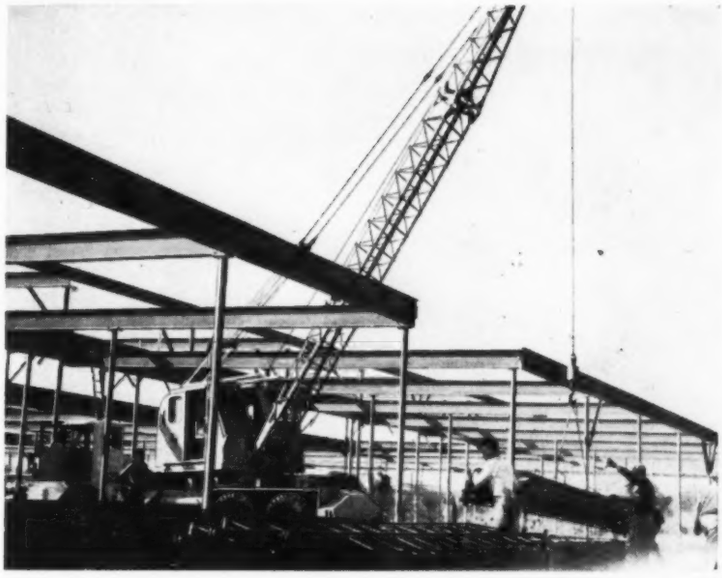
Front and rear axles of the new model are of advanced design, featur-



Four Jobs...

ONE MORNING

1. **Erect roof trusses**
2. **Unload cast-iron pipe**
3. **Set structural steel**
4. **Place prefab sheathing for roofing crew**



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This single morning's work is typical of Michigan. Although smallest of the cranes owned by F. H. McGraw Company, Inc., this Michigan 12-ton Truck Crane has worked on a wide variety of industrial construction jobs from Connecticut to Illinois. To the complete satisfaction of its owner, it has proved an outstanding time-saver . . . For *your* jobs, too, get the mobility, speed and dependable, economical performance of Michigan Mobile Shovel-Cranes. Send for full details.

MICHIGAN

MICHIGAN POWER SHOVEL COMPANY

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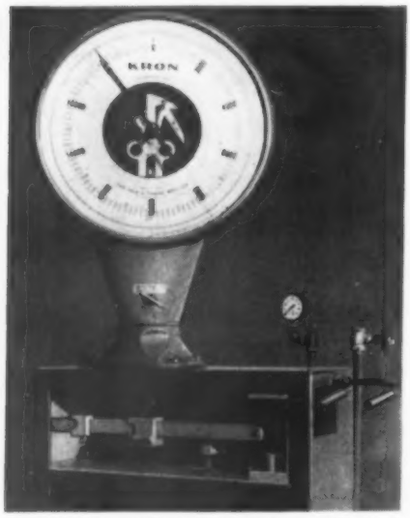
ing 17-in. spiral bevel, ring gears and pinions for strength and quietness. Pinions are straddle mounted to minimize deflection. The newly designed FWD "S" type constant mesh transmission with helical gears and easy sliding jaw clutches for easy shifting and quiet operation is provided in the new model. The new model is powered by the 140-GZ, 500 cu. in. high compression gasoline engine. The engine develops 188 H.P. at 2,060 r.p.m. governed speed and 460 ft. lb. of torque at 1,000 r.p.m.

10
Dial Scale on Batcher

A dial scale is now optional equipment on concrete weight batchers of Noble Co., Oakland, Calif. This scale is available in manual and semi-automatic models. On the semi-automatic type, weight of cement required is set on a poise beam, and the cut off at final weight is controlled by the Noble photo relay system of weight



Dial Scale on Batcher

control. Dial indicator is at zero position when cement weight is completed. Aggregate weight is cumulative dial reading from there on. The Noble back balance multiple beam scale is standard equipment on manual and semi-automatic batchers and is recommended for use where accuracy is of utmost importance. Both dial and poise-beam scales will be available.

11
New Crusher

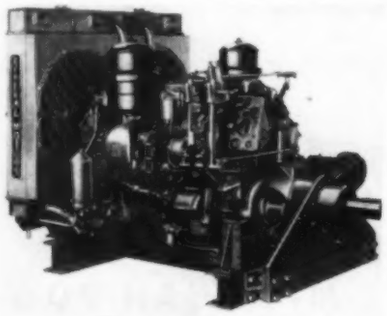
A Model 2020 double impeller breaker has been announced by the New Holland Manufacturing Co., Mountville, Pa., a division of the New Holland Machine Co. The 2020 is built on the same engineering principles as the New Holland 3030 Breaker. Impact applied in suspension is used to reduce any stone passing through a 20-in. opening. While this new breaker is designed primarily for gravel work, it has the same rugged construction as the 3030 and may be

Model 2020 Double Impeller Breaker

used to reduce any material not exceeding 20 in. by 20 in. by 36 in. Weight of the 2020 is 20,000 lb. Like the 3030, the 2020 is stated to have no vibration. Two impellers, each weighing 2930 lb., are carefully balanced. Because of their weight, these impellers, spinning in opposite directions, act somewhat like a gyroscope in keeping the machine stable in operation. Each impeller is equipped with three manganese steel bars weighing 265 lb. each. High grade alloy steel shafts have a diameter of 4-1/16 in. at the impeller core and 3-7/16 in. at the bearings.

12
New Diesel Engine

A twin 4 diesel engine has been added to the line of industrial power plants of Detroit Diesel Engine Division of General Motors Corporation, Detroit, Mich. The new multiple engine unit (Model 8-103) consists of 2 GM Series 71 4-cylinder diesels mounted side by side on a common base and geared to a single output shaft. The 170 continuous BHP developed by this multiple unit fills an important gap between single 6-cylinder and Twin 6 models in the GM



New Twin 4 Diesel Engine

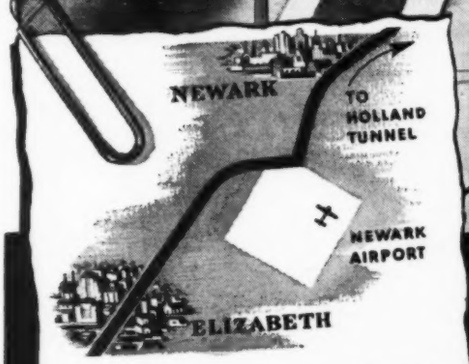
Series 71 line. In the interest of parts standardization and simplified maintenance, Detroit Diesel engineers have patterned the Twin 4 closely to the already widely accepted Twin 6. Many components such as transfer gear cases, clutch and throttle controls follow the same design and are interchangeable between the two models. Purchasers have a selection of four distinctively different power take-off arrangements to choose from so that the unit can be efficiently and economically adapted to a wide variety of industrial assignments. The following types are available as standard or optional equipment: 1. The H.D. or heavy-duty power take-off has been designed to take pulley or chain drive side thrust without the need of special cradle-mounted sheave or sprocket. 2. The S.S. or Stub Shaft can accommodate any of the various types of couplings encountered with heavy duty industrial machinery. 3. The O.H. or S.A.E. "O" size housing will support any close coupled power take-off within the proper horsepower range. This type is particularly suitable for applications with torque converters. 4. The D.F. or Drive Flange, is available for installations where the driven machinery is to be coupled directly to the power unit. Transfer gear cases may be obtained with gear ratios of 1 to 1, 1.33 to 1, 1.76 to 1, or 2 to 1.

13
New 4-Wheel Scrapers

New, improved cable-controlled S-type, 4-wheel scrapers are now in production by Bucyrus-Erie Co., South Milwaukee, Wis. Models included in this new series of scrapers are: the S-46- (4-cu.-yd. struck capacity), S-68 (6-cu.-yd. struck capacity), S-91 (8-cu.-yd. struck capacity), and the S-113 (10-cu.-yd. struck capacity). Increased maneuverability is one of the principal features stressed

6 cu. yd. S-68 Scraper

in the design of these improved scrapers. Low center of gravity, widespread rear wheels, and low bowl height provide stability for side-sloping. Drop-center front axle eliminates downward thrust on front wheels. Low fairlead hitch gives proper line lead, especially on sharp turns. Other improvements include: a hinged apron with adjustable opening for clean discharge of sticky materials; tilting bowl with curved section and high



100,000 Vehicles a day...on CONCRETE

New Jersey is reconstructing and modernizing Route 25 (U.S. 1) from Elizabeth to the Pulaski Skyway, which leads to the Holland Tunnel entrance to New York City. Air-entraining portland cement was used in this "dual-dual" expressway.

The pavement consists of two 10-in. x 24-ft. concrete roadways in each direction. Each pair of lanes has an adjoining paved shoulder for emergency stops where minor repairs can be made or where disabled vehicles can be parked till help arrives. The two inner lanes in each direction carry high-speed, through traffic; the two outer lanes in each direction carry local traffic.

This new "dual-dual" 8-lane expressway on New Jersey Route 25 (U.S. 1) is one of the world's most heavily traveled highways. It carries an average daily volume of 60,000 vehicles, including 10,000 trucks, and reaches holiday peaks of 100,000 vehicles.

This is another example showing how portland cement concrete pavement adequately answers the growing problem of traffic congestion. Portland cement concrete usually costs less to build than any other pavement of equal load-carrying capacity. Because of its long life and low maintenance expense, it gives many years of uninterrupted service at ***low annual cost***—the true measure of economy.

In addition, such pavements are safer to drive on because they are skid-resistant, wet or dry, and their natural light color increases visibility at night, making driving safer.

Write for a free copy of "Concrete Pavement Design," which will be helpful in planning your highway and street paving programs. Distributed only in U. S. and Canada.

PORTLAND CEMENT ASSOCIATION

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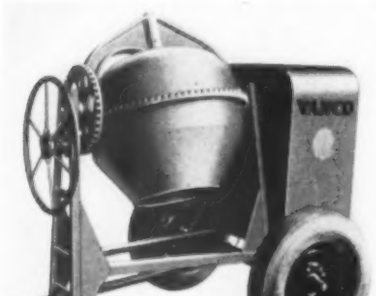
back for better loading; straight line cable reeving for reduced cable wear; positive bowl return which brings bowl back to loading position on any slope; and, as optional equipment, an adjustable push bumper with long contact bar to eliminate jackknifing. The scrapers also have Bucyrus-Erie's exclusive double-curve cutting edge.

14
New Mixer

A new, gasoline engine-driven mixer has been introduced by Vanco Products, Inc., of Colorado Springs, Colo.,



Model 35-25VR Concrete Mixer

as an addition to its line of small utility mixers. The new model, 35-25VR, is rated at 3½ cu. ft. capacity. The mixer has a heavy, semi-steel cast bowl and yoke; scientifically designed blades and a newly designed tilt gear for mixing and pouring from either side. A heavily reinforced angle frame supports engine and mixing chamber and is provided with a retractable tow-tongue. Engine power is provided by a 3 h.p. air-cooled gasoline engine driving through multiple V-belts. The mixer is mounted on high-speed trailer with two 6:00x16 pneumatic tires.

15
Twin Hoist for Pickup Trucks

New, fully automatic, hydraulically-operated, cab-controlled twin hoists and dump bodies for pickup trucks

Twin Hoist Dump Body for Pickup Truck

have been announced by National Truck Equipment Co., Dept. 453, Waukesha, Wis. The twin hoists for pickup trucks are an addition to the National Dump-o-Matic line. The new twin hoist unit, easily installed on nearly all makes and models of ¾ and 1-ton pickups, is controlled by a finger-tip lever in the cab. A single hoist unit has been designed for ½-ton pickups. The twin hoist unit has a tested and approved rated lifting capacity of three tons, with a wide safety factor for overloads. Installation of the hoists, in most cases, does not set the truck box up any higher than before installation. Actually, in many cases, the truck body sets conveniently lower after installation. The single hoist unit has a tested and approved rated lifting capacity of one ton, with a wide safety factor for overloads.

16
Clevis Grab Hook

A new clevis grab hook marketed by Thomas Laughlin Co., Portland, Me., is attached to the chain by merely slipping the clevis pin into place, spreading the cotter. This replaces shackling, cold-shutting, cutting, bending and re-welding the chain. No additional fittings of any kind are needed. All parts are drop forged

New Clevis Grab Hook

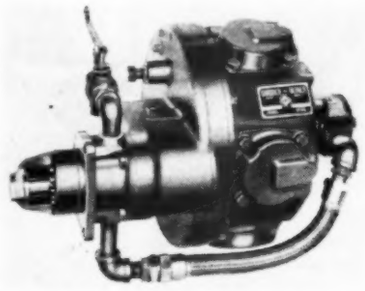
and heat treated for maximum strength and safety. A further safety feature is the special housing which covers the end of this clevis pin, preventing the cotter from catching in the workers' clothing or scratching their hands. The hooks are available in sizes from ¼ in. to ⅝ in.

17
New Concrete Cutter

A new cutter announced by Backlin Products Corporation, Burlington, Wis., has a diamond saw blade specially designed for concrete cutting and scoring, and is stated to cut 18 in. to 60 in. per minute at 1 in. to 3 in. depths. The machine is 1-man operated and weighs 395 lb. It is powered by a 1-cylinder, air-cooled, 6 h.p. Briggs-Stratton gasoline engine. The saw arbor is high-speed, self-aligning ball bearing spindle. The blade is a water-cooled circular diamond saw, continuous rim in 10-in. and 12-in. sizes. Depth of cut can be regulated from 1 in. to 3 in.

18
New Air Starters

A new line of air starters for gas, gasoline or diesel engines, including five sizes, developing from 3 to 15 H.P. on 100 lb. air pressure has been announced by Gardner-Denver Co. at Quincy, Ill. The principal advantages claimed for these air starters are their extremely high torque and the elimination of costly battery maintenance and replacements. The high torque



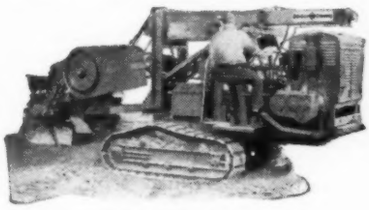
Model MBGS 5-Cylinder Radial Air Starter

characteristic of the piston type motor, it is said, makes it especially desirable for diesel applications involving high starting loads, while the 5-cylinder radial design provides even torque through the operating cycle. An exclusive Gardner-Denver feature is an air actuated starter pinion which, when the air valve is open, automatically engages the ring gear a split second before the starter begins to crank the engine, thus assuring positive and safe engagement.

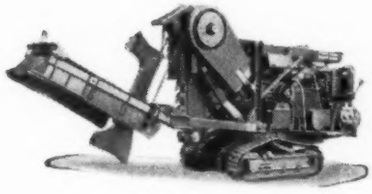
19
Two New Ditchers

Two new ditching machines added to the line of Barber-Greene Co., Aurora, Ill., feature many of the advancements well-proved in the line of B-G 44C Ditchers, plus new developments that include the B-G three-position boom which is quickly adjustable (left, center or right), to dig close to obstructions. The new B-G Model 720—for digging trenches 8 in. to 11 in. wide and up to 4 ft. in depth, incorporates the advantages of the vertical boom design with the new three-position feature that allows boom adjustment to make possible closer adherence to the digging line. The vertical boom digs straight down, leaves no ramp. Its self-cleaning

buckets, an established Barber-Greene development, cut like a milling machine into toughest ground, minimize service and maintenance expense.



720 Ditcher

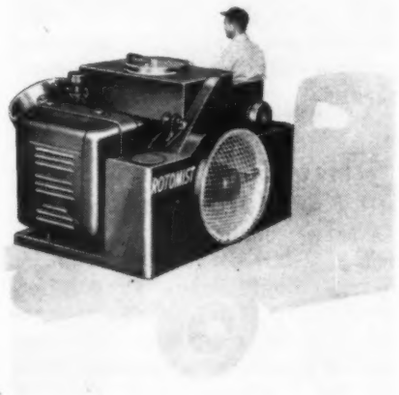


710 Ditcher

Digging speeds of the B-G Model 720 are as high as 32 F.P.M.; travel speeds range to 234 F.P.M. Spoils conveyor is adjustable to either side. The Model 710 is designed for digging trenches up to 5½ in. wide and 42 in. deep. Compact, easily and quickly transported—by truck for long hauls at 234 F.P.M. between adjacent jobs—the 710 has digging speeds up to 32 F.P.M. A special cable-laying attachment is available for feeding cable and plowing over the spoil in one continuous pass. The Model 710 also incorporates the benefits of the "Three Position Vertical-Boom" design, self-cleaning—"milling-action" buckets and other features found in the Model 720.

20
Shade Tree Sprayer

A new machine claimed to speed the application of dust or concentrates for pest control in shade trees is now in production by the John Bean Co., Lansing, Mich. Called the "Rotomist," this machine is mounted on a truck or trailer with a powered turntable which permits the operator to control direction and output of concentrates, wet dust or dry dust. Because the "Rotomist" has an output of 20,000 cu. ft. of air per minute, thorough coverage is stated to be possible on even the largest shade trees.



The "Rotomist"

21
Crane Boom Added to Towermobile

A crane boom has been added to the chassis of the Towermobile, a product of Mixermobile Manufacturers, Portland, Ore. It is stated this addition gives the contractor a chance to perform a good many more operations with the same piece of Mobile equipment. Originally the Towermobile was capable of being driven to the job, erected in a matter of 10 or 15 minutes by only one man, and hoisting concrete or other building materials. Now, this same operation can still be accomplished, but an operator also has a 20 ft. boom with a lifting capacity of 9,000 lb. on a line 7 ft. to the rear of the truck chassis. An unusual feature of this combination lifting and hoisting machine is the fact the tower can be completely removed from the chassis and set to one side by the machine's own boom.

Towermobile-Crane

22
New Paving Breaker

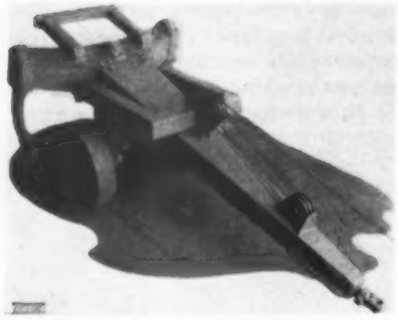
A new paving breaker now in production by R. P. B. Corporation, Los Angeles, Calif., is stated in initial tests to have broken 900 sq. ft. of 4 in. concrete pavement per hour. It is claimed it will break concrete and other high type pavement up to 10 in. thick. One of the features claimed for the model is its ability to operate at its rated capacity of 55-60 blows per minute on a 105 cu. ft. per minute air compressor. The new paving breaker is mounted on a tricycle running gear and is driven by an air motor having ability to move the machine up a 15 degree incline. The air motor is geared to its wheels. One operator can operate the machine. The new machine is 4 ft. 8 in. long by 4½ ft. wide by 5 ft. high, and weighs 1,450 lb. It is sturdily built throughout, however, with a 3-in. piston rod, 5-in. cylinder bore, a 125-lb. hammer head and a strong, all-welded frame. Up and down adjustment of the power cylinder will provide the full effective energy of its normal 24-in. length of stroke at all times.

"Mighty Midget" Paving Breaker

23
New Cable-Controlled Tractor Equipment

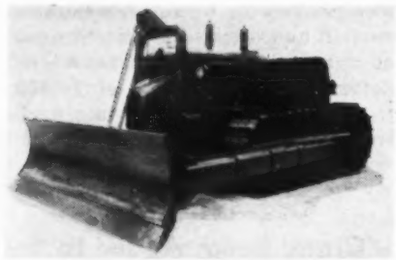
A complete line of cable-controlled tractor equipment, including bullgrader, bulldozer, scraper and ripper, especially designed by Bucyrus-Erie Co., South Milwaukee, Wis., for the new International TD-24 crawler tractor is now in production by the Bucyrus-Erie Co. The construction of every one of the machines is balanced to make the most of TD-24 power with minimum stress on tractor or attachment. High-test steel castings, poured in Bucyrus-Erie's own foundry and tested in its metallurgical laboratory, are used in combination with weldments. Full visibility is one of the most important features of the bullgrader and bulldozer. The new scraper, called the B-250, has a struck capacity of 22 cu. yd. Low center of gravity makes for speed and stability in field

Bucyrus-Erie B-250 Scraper



Bucyrus-Erie Model CR-4 Ripper

operation. Differential bowl and apron reeving keeps rope pulls low while giving maximum power at the start of the positive rolling ejection dump.



Bucyrus-Erie Bullgrader

The scraper's apron can easily be converted from the conventional solid type to a hinged type for fast ejection of even the stickiest materials. Other B-250 features are: exclusive double-curve cutting edge which "boils" dirt upward into the apron and bowl with minimum compacting; front-mounted hoist tackle and widespread rear wheels for maximum stability. The Bucyrus-Erie heavy duty ripper, Model CR-4 has detachable alloy steel standards, angled for natural digging suction. V-shaped rear end and proper spacing of standards allow ample clearance for up-rooted materials. Power for the new TD-24 tractor equipment is controlled by either a front-mounted or rear-mounted power control winch. The front-mounted winch, designed especially for the TD-24, is a single drum unit for bullgrader or bulldozer control. The rear-mounted winch is double drum and can be used with bullgrader, bulldozer, scraper, ripper, or other attachments. Both winches have planetary drive which eliminates the need for frequent adjustments.

WHEN Better Roads Are Built . . .

Fulco COTTON Concrete-Curing MATS

ARE USED FOR 7 "TOP" REASONS!

- ✓ The compressive strength of concrete cured with Fulco Mats is greater than concrete cured by any other method.
- ✓ Concrete is correctly cured in only 72 hours with Fulco Mats—hours shorter than the time required with the wet-burlap, wet-earth method.
- ✓ Fulco Mats are usable 50 to 75 times—more economical in the long run.
- ✓ Fulco Mats insure a uniform concrete curing job.
- ✓ Results are dependable — the possibility of cracking greatly reduced.
- ✓ Fulco Mats are more efficient for insulation against temperature changes in concrete during its setting period.
- ✓ Fulco Mats are easy to keep dripping wet during the critical curing time—and require less water.

Fulco

FULCO Mats are made 5½' x 22' in size, durably covered with tough osnaburg, filled with padding weighing 12 oz. per sq. yd. Stitches are 4" apart along length. Edges are stitched. 6" double osnaburg flap along one 22' side.

Write for further information and price lists. Address nearest factory branch.

FULTON BAG & COTTON MILLS

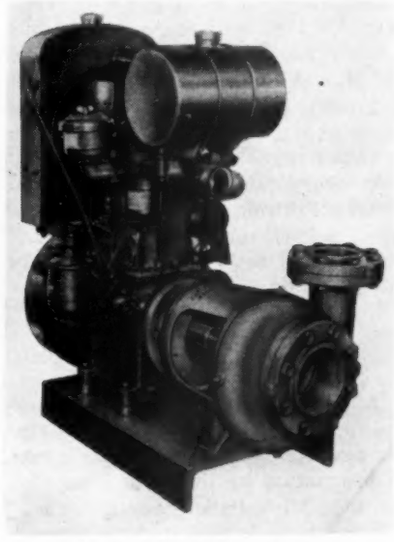
Manufacturers Since 1870

New Orleans, Denver, St. Louis, Atlanta, Dallas, Minneapolis, Kansas City, Kans., New York

24

Diesel-driven Pumps

Jacuzzi Bros., Inc., Richmond, Cal., and St. Louis, Mo., have announced that several of the 6 and 8 h.p. Jacuzzi pumps are now available, powered by single-cylinder diesel engines



Jacuzzi Diesel-Driven Pump

equipped with electric starters. The diesel can be connected to the pump either directly or by a belt, depending upon the depth of water or pressure required.

25

New Concrete Form Hardware

A new combination of concrete form hardware produced by Williams Form Engineering Corporation, Grand Rapids, Mich., is shown in the accompanying illustration. The cut shows a section of a standard form with 2x4 walers and studs and 1 in. sheathing set on the concrete footing:

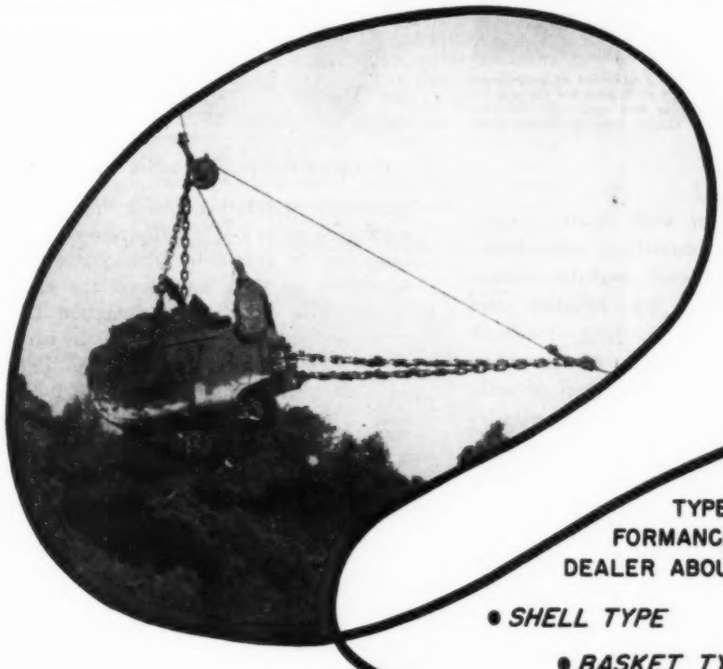
GREATER YARDAGE!
LOWER COST!

WELLMAN *Williams* WELDED BUCKETS

Wellman Buckets cost less to maintain because they are ruggedly built. They deliver bigger payloads because they are properly designed. The superior engineering in Wellman Buckets gives the operator better balance, easier handling, cleaner digging. Wellman pioneered the unique construction that pays off in greater yardage at lower costs. There's a Wellman Bucket for every service.

SEND FOR BULLETIN

THE WELLMAN ENGINEERING COMPANY
7003 CENTRAL AVENUE CLEVELAND 4, OHIO



Tough Jobs Demand Yaun Quality

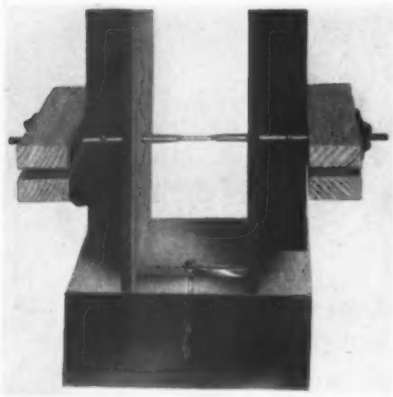
THE PERFECT BALANCE AND TOP ENGINEERING DESIGN IN EVERY TYPE *YAUN* BUCKET ASSURES EXCELLENT PERFORMANCE ON THE TOUGHEST JOBS. ASK YOUR DEALER ABOUT *YAUN'S* ADVANTAGES OR WRITE DIRECT.

- *SHELL TYPE*
- *PERFORATED TYPE* (ILLUSTRATED)
- *BASKET TYPE*

YAUN

DRAGLINE BUCKETS AND MFG. PLANT
BATON ROUGE, LA.

WRITE FOR FREE DESCRIPTIVE LITERATURE AND CATALOGUE



New Combination of Concrete Form Hardware

the forms being held to proper alignment by the new Williams adjustable form aligner anchored in the footing. This consists of 2 parallel bars clamped onto the protruding end of the pigtail anchor set at the position approximately midway between the forms, and later adjusted to a chalk line to properly space the forms. The forms are spaced externally above the footing line by driving a nail through the she-bolt in the concrete (as illustrated) into the stud. The external form pressure is secured by the outer castings on the she-bolt. These are termed fly nut castings and differ from the ordinary nut castings in that they do not require a wrench for adjustment or removal. They contain lugs that may be hit with an ordinary carpenter's hammer to rotate the castings in the direction desired. The she-bolt itself does not require a wrench for removal as it contains a cross drill for locking the outer castings to same with a 16 penny nail. Wood cleat supports under the waler are eliminated on the left side of the photo. These, nailed to the stud with one or two 8 penny nails, are sufficiently strong to support the weight of two or three men on the walers. This metal waler support has a heel in compression against the stud which prevents any tendency to shear-off the nails.

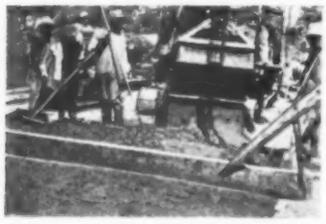
GET MORE of the ADVANTAGES of ASPHALT with BITUCOTE EMULSIONS

Non-volatile — no heating required — no fire hazards.

A finer, easy-to-maintain, non-skid pavement of permanent ductility economically constructed with Bitucote throughout — base stabilization, wear course and seal coat. Bitucote may also be applied as wear course only, with seal-coat, for low budget roads.

Mixes with most common local aggregates.

Penetration for base stabilization — and uniformly mixes with materials already in road bed.



Plant mixed or road mixed with minimum equipment, operating and labor costs.

Besides the common, well known assets of asphalt—lasting ductility, versatility, economy and low cost maintenance—Bitucote Emulsion is non-volatile and safe—Applied without heating—no flash fire or explosion hazards are encountered. It is necessarily formulated of only the highest grade crudes—for quality control. Mixed with most common local aggregates in road plant or portable pugmill . . . or blade-mixed with existing material or road base. Bitucote high stability and retained ductility assure low maintenance cost. Surface texture can be made permanently non-skid.

Bitucote is unsurpassed for quality and economy in road maintenance.

Send for booklet "Pave It Better With Bitucote"

Bitucote PRODUCTS CO.

Get more of the advantages of asphalt with Bitucote Emulsion!

1411 CENTRAL INDUSTRIAL DRIVE • ST. LOUIS 10, MO.
Plants in: Cincinnati, O. • St. Louis, Mo. • El Dorado, Ark.

26
Automatic Sealing Couplings

Automatic shut-off upon disconnection and instantaneous flow upon connection is the important feature claimed for a new series of couplings announced by Roylyn, Inc., Glendale, Calif. - This coupling combines the automatic sealing feature with the

Group of Roylyn 1300 Series Couplings

patented quick-disconnect principle exclusive with Roylyn Couplings. The coupling is available with the valve in either or both halves of the coupling. The coupling is designed for trouble-free operation over a wide pressure and temperature range. It is available in sizes from ¼ in. to 2 in., and in dural, bronze and steel. It is vibration-proof and incorporates a full swiveling action that prevents kinking of the hose. A partial list of applications of the coupling includes road and farm equipment, tank loading of petroleum products and other fluids, truck and trailer units, steam and pneumatic lines, aircraft hydraulic systems, etc.

27
One-Man Hoist

A new one-man hoist introduced by American Gage & Manufacturing Co., Dayton, Ohio, is stated to have a ¾-ton capacity yet weighs only 6 lb. It is claimed it can be used on any pulling job where a chain hoist or block

WHAT THOSE HIGHWAYS NEED IS A

"SPRAY MASTER"

ON THE JOB

"Spray Master" Distributors are designed for low cost, efficient Road Building and Maintenance. Operating time is cut to a minimum. With a 24 ft. Vacuum Flow Full Circulating Spray Bar asphalt, tar, emulsion or road oil can be sprayed with razor like precision. *No gadgets to mess with* either, the "Spray Master" *has one valve* for starting and stopping the spray. Manual operating individual nozzles can reduce the spraying width in a few seconds. Low cost and efficient operation is the watchword of the Littleford "Spray Master." The Faster Heating System, Hydraulic Spray Bar Adjustment, Circulating by Vacuum not pressure, Heat Chamber, are only a few of the advantages the "Spray Master" gives as standard equipment. Made in sizes from 800 to 3000 gal. truck mounted or frameless semi-trailer. For Better Roads use the best equipment, the "Spray Master" Distributor. Write for Bulletin No. 14.

MANUFACTURERS OF

"Spray Master" Pressure Distributors

"Tankar" Steam Heaters	Highway Brooms	Asphalt Supply Tanks
"Kwik-Melter" Roofers Kettles	Tool Heaters	No. 101 Utility Spray Tanks
Trail-O-Rollers	Trail-O-Distributors	84-HD Asphalt Kettles

BLACK TOP ROAD MAINTENANCE EQUIPMENT — LB — SINCE - 1900

LITTLEFORD

LITTLEFORD BROS., INC.

454 E. Pearl St., Cincinnati 2, Ohio

HEAVY-DUTY

from RADIATOR to DRAWBAR

MINNEAPOLIS-MOLINE MM MODERN MACHINERY

A complete line of attachments and uniformly high performance qualify MM Industrial Tractors for a wide variety of construction and maintenance jobs. Special heavy construction of each part makes them toughest built from radiator to drawbar for longer service on the job with minimum maintenance.

To make them the easiest handling industrial tractors for their capacity, MM design employs the Ross steering gear and anti-friction bearings at important points, as well as high capacity front axle and tires.

Plan to see MM Modern Industrial Tractors and Power Units on Display at the Road Show in Chicago

MINNEAPOLIS-MOLINE

POWER IMPLEMENT COMPANY

MINNEAPOLIS 1, MINNESOTA

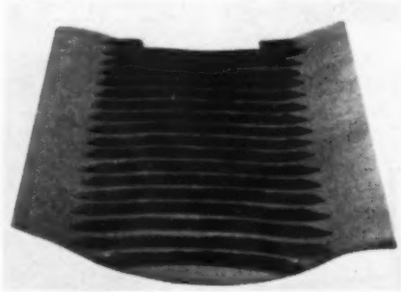
"Pow'r Pull" Hoist

and tackle are now used and can be used on both vertical and horizontal pulls. The hoist is made of high tensile manganese bronze; aluminum bronze, navy bronze, Duraluminum, aircraft cable and cadmium-plated steel.

28

New Conveyor Belt

A new ribbed-top conveyor belt developed by Goodyear Tire & Rubber Co., Akron, O., has been designed especially to prevent backslip in carrying sand and gravel and wet-mixed concrete up steep inclines. The new belt, first of its kind in the Goodyear line, features chevron-shaped ribs ¼-in. higher than the belt surface. The ribs serve as barriers, trapping the water and preventing the backwash of materials down the belt on incline operations. The ribbed belt is stated to eliminate any noticeable back-slipping of most wet materials on inclines up to a 20-degree angle. The ribbed cleats also are stated to increase belt life substantially by reducing the severe wear a back-slipping load inflicts



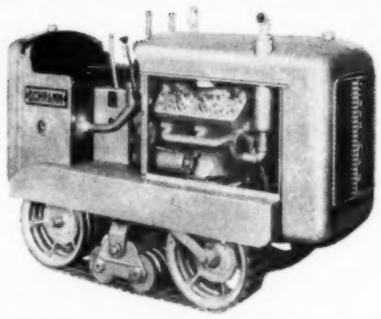
Ribs on New Conveyor Belt

on a conventional belt in motion. The curved ribs are closely spaced to overlap each other and assure a smooth return run of the belt over idlers. The new belt has a 5-ply rubberized fabric body, and a ¼-in. top cover in addition to the ribs. It is being made in widths of 30 to 48 in. and in lengths to customers' specifications.

29

Crawler-Type Compressor

A new model crawler-type compressor, announced by Schramm, Inc., West Chester, Pa., provides for a wide variety of applications for pneumatic



Schramm Model 60 Crawler-Type Compressor

tools and also offers the possibilities of operating many other attachments. Features of the model include the following: Seat is provided for operator. Continuous rubber track with integral lugs is provided which has flexible steel tension cords properly imbedded. Electrical starter which permits complete control without leaving seat. Unit provided with a drawbar. Other equipment can be readily removed. Speed of the crawler is from 1 to 18 miles per hour and is regulated by a transmission having four speeds forward and one in reverse. Hydraulic steering is used and crawler is under separate control of operator by means of two steering levers. Lifting eye is available and is important factor for railroads, shipyards, etc. The model has a length, including draw-

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Servicised Products Corporation has originated and developed outstanding quality products for over 28 years. These quality products are specified for general construction throughout the United States, in Canada, South America, and Europe.

APPROVED CONSTRUCTION MATERIALS

- **EXPANSION JOINT FILLERS:**
  - PARA-PLASTIC Hot-Poured Rubberized Sealer
  - Premolded KORK-PAK Joint
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  - Premolded SELF-EXPANDING CORK Joint
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  - ASPHALT PLANK Industrial Floors
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  - TUFFLEX Premixed Trowling Plastic
  - VITRIFLEX Hot-Poured Compound
  - PREMOLDED BELT Calking Process
- **ROOFING AND INSULATION MATERIALS:**
  - PARA-PLASTIC Roof Coating
  - ASPHALT PLANK For Roofs
  - KORK-PAK INSULATION BOARD
  - ASPHALT MASTIC INSULATION BOARD
  - CANT STRIP ROOF FLASHING

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at Soldier Field

July 16-24

Displaying the various construction materials that gave us our highways.

DESIGNERS AND MANUFACTURERS OF CONSTRUCTION MATERIALS FOR OVER 28 YEARS

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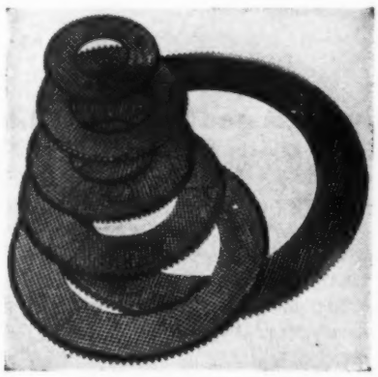
SERVICISED PRODUCTS CORP.
6051 West 65th Street, Chicago 38, Ill.

bar, of 88 in., a width of 32⅞ in., and a height of 51½ in. The weight is 2,600 lb. The fuel tank has a capacity of 7 gal.

30
Clutch Facings

Clutch facings which feature a balanced combination of moulded and woven asbestos structures have been announced by the Gatke Corporation, Chicago, Ill. The combination is achieved through a Gatke-developed process of assembling the woven asbestos material with moulding compounds before moulding to the required shape and size. Developed to



Improved Asbestos Clutch Facings

meet the severe service requirements of excavating, road building and construction equipment, it is claimed this woven-moulded structure maintains high frictional efficiency over a tremendous temperature range. Clutch facings of this friction material can be furnished in plain disc type or with integrally moulded teeth for all requirements.

MANUFACTURERS' LITERATURE

31
Heavy Duty Oil

New descriptive literature for Colonel Drake heavy duty oil has been issued by Pennsylvania Refining Co., Butler, Pa. Features of the oil are covered in detail by the 6-page booklet which emphasizes the fully-detergent, fully-dispersive and non-foaming characteristics.

32
New Wire Rope Sling

The "Hercules" (Red-Strand) flat-laced wire rope sling added recently to the line of A. Leschen & Sons Rope Co., St. Louis, Mo., is fully illustrated

THE *DIXIE* CARRIER keeps water COOL for hours

uses clean *VORTEX CUPS*

Plenty of cool water means plenty more work. The Dixie Portable Water Carrier is specially designed to refresh and invigorate your men on the job. Features include:

- Insulation that keeps water cool for hours
- Stainless steel interior that prevents rust
- Snap-lock lid for easy filling and cleaning
- Recessed faucet and steady stream for quick service
- Lightweight, durable all-metal tank in olive and chrome
- Four gallon capacity

The Dixie Portable Water Carrier* dispenses inexpensive Vortex Cups, which are pleasant to use and leakproof. Clean, disposable Vortex Cups are great preventers of absenteeism caused by colds and other mouth-carried illnesses. Write for booklet on Dixie Portable Water Carrier to Dixie Cup Company, Easton, Pa.

** Also available for flat-bottomed Dixie Cups.*

The JACKSON
HYDRAULIC VIBRATOR'S

50-FOOT REACH
Saves numerous relocations

50 FOOT REACH

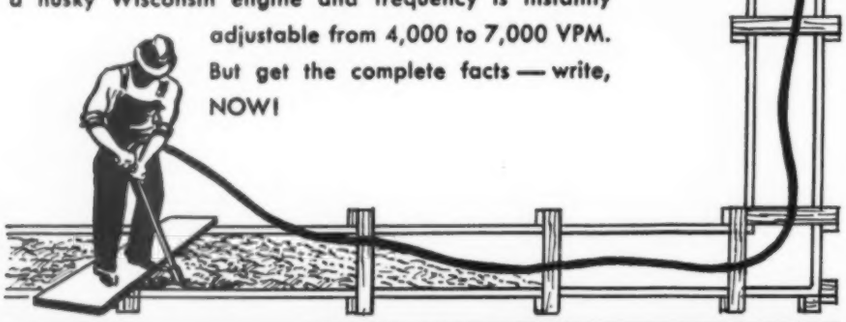
This famous, time-proved concrete vibrator, which rates Ace-High with the vast majority of contractors, is now available with hose lengths up to 50 feet — a feature that saves plenty of time by making frequent relocations unnecessary.

Improved, interchangeable fittings permit reversing hose handle when vibrator end shows wear, thus doubling hose life and use. If you are not thoroughly acquainted with the Jackson Hydraulic, write for the complete facts, at once. With these at hand you will quickly recognize it as the most dependable, trouble-free vibrator in its class, ideally suited to general concrete construction.

JACKSON CONCRETE VIBRATOR
Model HS-A2

50 FOOT REACH

There are no troublesome parts to break, and since all parts run in oil, no lubrication problem. It's powered by a husky Wisconsin engine and frequency is instantly adjustable from 4,000 to 7,000 VPM. But get the complete facts — write, NOW!



ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN

and described in a bulletin of the above company. This sling consists of a flat body made with six parts of "Hercules" (Red-Strand) wire rope laced, together—not braided—in a manner that eliminates placing the parts in shear under the pressure of a load. This construction of the body section produces a flat and flexible support twice as wide as its thickness. Because of its flat, belt-like surface, load pressure is distributed over a greater area than with a round bodied sling, resulting, it is stated, in less wear to the sling and less marking of highly finished surfaces on the load. The loops on the ends are designed to be self-supporting without the use of thimbles or servings.

33

Crushers and Grinding Mills

Two new bulletins of its Crusher and Process Machinery Divisions have been announced by Nordberg Manufacturing Co., Milwaukee 7, Wis.: Bulletin 149, Nordberg machinery for Processing ores and minerals, is an 8-page pamphlet illustrating and giving a general description of 21 different machines manufactured by the Crusher and the Process Machinery Divisions of Nordberg. Bulletin 152 is a 4-page pamphlet giving in some detail the advantages and special design features of Nordberg grinding mills of the ball, pebble, rod, tube and compartment types.

34

Truck Weight Restrictions

The 1948 truck & trailer size & weight restrictions booklet which includes the most up-to-date listing of laws affecting size and weight restrictions for commercial vehicles is ready for distribution by The Four Wheel Drive Auto Co., Clintonville, Wis. The new booklet covers all of the 48 states and explains graphically the differences between the Motor Vehicle Laws of the several states.

35

Bucket Loader

The K-5 bucket loader, built heavily enough for pit and road work yet quickly maneuverable in busy yards, is described in a bulletin released by the N. P. Nelson Iron Works, Clifton, N. J. The bulletin tells in detail about the unit which is equipped with a two-strand elevator and four-speed transmission. Separate Twin Disc clutches control traction and elevator, the latter having an automatic overload release to prevent damage to the machine.

36

Castings

Revised—8 pages, with abrasion problem questionnaire, a booklet offered by The International Nickel Co., Inc., 67 Wall St., New York 5, N. Y., presents the facilities, specialities and locations of authorized producers of Ni-Hard, a nickel-chromium white alloy cast iron, the hardest commercial product of the iron foundry. The abrasion problem questionnaire enables you to submit sufficient information on a problem for a recommendation of a suitable material to be used in your service.

37

Weigh Batchers

A new six page folder on Noble weigh batchers has been released, by Noble Co., Oakland, Calif. The folder describes and illustrates Noble's three types of batching control: manual, semi-automatic, and full-automatic. Dial scales, recently made optional equipment on Noble manual and semi-automatic batchers, are included in the folder, as well as the highly accurate Noble back-balance poise beam scales.

38

Tournadozer

Application photos and diagrams featured in a new four page Tournadozer folder prepared by R. G. LeTourneau, Inc., Peoria, Ill., help explain how non-productive dozer time can be cut and how dozer work can be generally speeded up with a Tournadozer. All the new features of the Tournadozer are explained and basic specifications are given.

39

Steel Sheet Piling

Folder No. F-110, describing the company's new light-weight interlocking steel-sheet piling, has been issued by L. B. Foster Co., Box 1647, Pittsburgh, 30, Pa. The bulletin gives advantages, physical characteristics, suggested applications, etc., of the high-strength, box-type corrugated piling, stated to be especially suited for use where heavy piling is not necessary.

40

Cleaning Construction Equipment

A thorough-going review of the theory and applications of industrial steam-detergent cleaning is presented in an interesting, illustrated service report published by Oakite Products,

KINNEY BITUMINOUS DISTRIBUTORS

FOR UNIFORM APPLICATION

Kinney Bituminous Distributors are built to apply all grades of bitumen fast, accurately, and uniformly: never skimping, never wasting costly material.

- Kinney Rotating Plunger Pump has positive displacement — is accurate as a meter. Capacity to 405 GPM.
- Pump Jacket is heated by truck exhaust for easy starting with sluggish materials.
- Tachometer shows exact revolutions of pump and engine for regulating pump output.
- Fifth wheel drive with "Bitumeter" head tells road speed in feet per minute and total distance travelled.
- One simple three-way valve gives instant control of entire operation: circulating, loading and spraying.
- Large handwheel provides 14" lateral spray-bar movement for exact matching of tar strips and edges.

Write for Bulletins.

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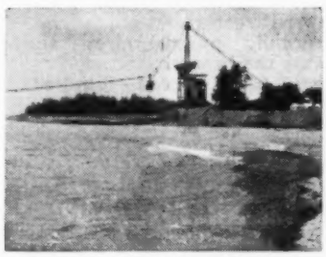
New York • Chicago • Philadelphia • Los Angeles • San Francisco
We also manufacture Vacuum Pumps, Liquid Pumps and Clutches

Save Power and Labor On Your Long Haul Digging



This Sauerman Slackline Cableway digs gravel from lake and keeps screening plant supplied with 75 tons an hour.

Sauerman Scraper moves material from wide pit to crusher.

SAUERMAN

CABLEWAYS and SCRAPERS

Your next material handling job will move faster and smoother, and pay off in real savings if you use the Sauerman method. With one of these Sauerman machines you can reach out across a wide area, digging, hauling and dumping automatically in one economical operation. Requires only one man at the controls and power consumption is remarkably small, whether electric, gasoline or Diesel. Installation cost is low and maintenance simple.

Let us recommend the right type of machine for your class of work. Send for our illustrated Catalog and tell us about your own problems.

SAUERMAN BROS., Inc.
588 So. Clinton St. Chicago 7, Ill.

Improve Your Asphalt Resurfacing At Less Cost

LITTLE GIANT
POWER SWEEPER

Gives you a cleaner surface for applying the seal coat in asphalt paving. Helps eliminate bubbles and blisters—assures more permanent paving. Also used for city clean-up work and snow removal.

- One-man sweeper. Quickly pays for itself in labor saved.
- Sweeps 20,000 to 30,000 square yards of surface per hour at normal speed, depending on length of brush used.
- Adjustable sweeping pressure to meet all conditions.
- Brush lengths from 5 to 9 feet.
- Quick-on and quick-off. Mounts on late model Ford, Chevrolet and Dodge trucks—Jeeps—Ford, Oliver, Minneapolis-Moline, International and Hebard tractors.
- Hydraulic pump raises and lowers the broom.
- Tested and proved—hundreds in use.

▲ **SPRINKLER ATTACHMENT**
Sprinkles just ahead of the broom—holds down dust. Water drums are carried on truck bed or on Little Giant trailer. Quickly attached. Low cost.

▲ **SNOW BLADE ATTACHMENT**
Snow blade replaces the brush. Easy to attach in 20 minutes. Scraping edge is replaceable. Three lengths—69", 81" and 93". Blade height, 3 ft. Heavy duty.

WRITE, stating your make and model of truck or tractor.

— SINCE 1918 —

LITTLE GIANT PRODUCTS, Inc., 1592 N. Adams St., Peoria, Ill.

Inc., New York. Typical instances where the application of steam-detergent cleaning has made possible time and cost-savings in the construction field are cited in the report to be: heavy-duty cleaning of steam hoists, derrick gears, motors, tractors, compressors, concrete mixers, concrete-carrying trucks, gas engines, road graders, diesel cranes, and other types of earth-moving, pit and quarry equipment. In addition to listing many tasks for which steam detergent cleaning has demonstrated exceptional effectiveness, the Service Report supplies much interesting data on types of steam-cleaning equipment available and on specific detergents designed for use with such equipment.

41
Welding Methods

An 8-page bulletin issued by Eutectic Welding Alloys Corporation, New York, N. Y., illustrates numerous methods of applications and stresses valuable means of avoiding the usual welding problems. The bulletin describes the appropriate welding rod for the particular job. For both oxyacetylene and arc users, complete descriptions of metals, techniques and applications are included.

WITH THE MANUFACTURERS & DISTRIBUTORS

New Marion Sales Representative

John R. Hildinger has been appointed sales representative of Marion Power Shovel Co. with headquarters at the main office and factory in Marion, O. His territory includes western Ohio, a large part of the southern peninsula of Michigan and the eastern half of Kentucky. Soon after receiving a degree in civil engineering from the University of Michigan, Mr. Hildinger enlisted in the Seabees. He was discharged in 1946 after almost four years' service as an officer in this country and in the Pacific Theater. Before coming with Marion, he was associated for approximately a year with an excavation contractor in Lima, Peru.

J. R. Hildinger

YOU'LL BUILD
Better ROADS *Faster*
AND BE
Money Ahead
WITH THE
SISALKRAFT METHOD
OF CURING AND PROTECTION

The SISALKRAFT Method gives you time and labor-saving advantages that cut your curing costs in half! Years of experience and research have developed improved application techniques. SISALKRAFT now is ready with new efficiency and new low costs for your paving season *this year!*

WRITE FOR THE NEW SISALKRAFT ROAD BOOK

It contains data you will value.

The SISALKRAFT Co., Dept. RS
205 W. Wacker Drive, Chicago 6, Illinois
Please send the SISALKRAFT ROAD BOOK to:

NAME

FIRM NAME

ADDRESS

CITY, ZONE and STATE

THE SISALKRAFT CO.
Chicago 6 • New York 17 • San Francisco 5

Lima Appoints Buchanan

H. H. Buchanan

Buchanan Co., 1710 Grant Ave., Kansas City, Mo., has been appointed sales agent for Lima Shovel and Crane Division of Lima - Hamilton Corporation, Lima, O., for the states of Oklahoma and Kansas, and Western Missouri. Hugh H. Buchanan, principal of the company, until recently, was director of foreign operations for Lima Shovel and Crane Division, Lima-Hamilton Corporation, and Michigan Power Shovel Co., Benton Harbor, Mich. He resigned his position with the above companies to form his own company.

Koppers Consolidates Sales Offices

Koppers Co., Inc., Pittsburgh, Pa., has announced that its divisional sales offices in the New York area are being consolidated in the Empire State Building, New York, and that sa'es offices in the Chicago area are being consolidated in the Peoples Gas, Light & Coke Building, Chicago.

A. E. Goodhue Is Dead

Allan E. Goodhue, vice president and director of Chicago Pneumatic Tool Co., 6 E. 44th St., New York died recently, after a short illness. Mr. Goodhue joined Chicago Pneumatic in 1919, and managed the company's interests in England until June 1920. He returned to this country at that time, and was elected vice president in charge of sales.

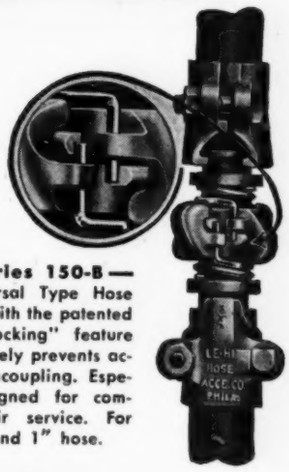
Changes Name

The name of The American Rolling Mill Co., Middletown, O., was officially changed to "Armco Steel Corporation" at the annual meeting of stockholders April 15. There is no change in the name of Armco Drainage & Metal Products, Inc., a subsidiary that manufactures metal drainage and construction products used on highways, railroads, airports, and by various industries.

Esco Expands Plant

Electric Steel Foundry, Portland, Ore., manufacturers of dragline buckets and power shovel dippers, is expanding its branch plant at Danville, Ill. New construction will increase present floor area of the shops by 125% and a new office building is to be included in the current expansion program.

LE-HI



LE-HI Series 150-B — The Universal Type Hose Coupling with the patented "Safety-Locking" feature that positively prevents accidental uncoupling. Especially designed for compressed air service. For ½", ¾" and 1" hose.

HOSE COUPLINGS

LE-HI Series 200-G or W — "Light Type" Air Hammer Hose Couplings. For *lighter* rock drills, jack hammers, sinkers, tampers, etc. Fast, easy coupling and uncoupling. Fully interchangeable. For ½" and ¾" hose. Available in ground joint and washer types.

ARE TOUGH

LE-HI Series 350-G or W — Heavy Duty Air Hammer Hose Couplings. Designed for the toughest kind of jobs. For *heavy* jack hammers, rock drills, and sinkers; also drifters, stopers, wagon drills, etc. Maximum air flow. Leak-proof seal. For ¾" and 1" hose. Ground joint and washer types available.

LE-HI MAKES A GOOD CONNECTION!

Go to your local distributor for these rugged, economical LE-HI Hose Couplings — NEVER SOLD DIRECT.

LE-HI HIGH and LOW PRESSURE HOSE COUPLINGS

HOSE ACCESSORIES CO.
2762 North 17th Street
Philadelphia 32, Pennsylvania
Branches at Chicago, Houston and Los Angeles

save time between jobs with JAHN TILT TRAILERS

Tilt—load—and you're off in a matter of minutes with a Jahn Tilt Trailer. No jacks or loading ramps required. One-man operation. Positive, automatic safety lock holds platform in position when loaded or empty. Rubber mounted drawbar absorbs road shocks and protects both truck and trailer. Ideal for transporting tractors—rollers—compressors—shovel-loaders—mixers, etc. Jahn Tilt Trailers are available in 8 ton capacity tandem axle and 5 ton capacity single axle models. Write for specifications and illustrated bulletin or see your nearest Jahn distributor.

C. R. JAHN COMPANY

Dept. 1345—1106 W. 35th Street, Chicago 9, Illinois

Heavy duty trailers from 5 to 100 tons

Timken Organizational Changes

Officials of The Timken Roller Bearing Co., Canton, O., have announced five Bearing Division organizational changes as follows: Blair Glenn, General Superintendent of the Canton Bearing Division, has been promoted to assistant factory manager of the Canton Bearing Division. Henry Tobey, Canton Bearing Factory Metallurgist, has been appointed general superintendent of the Canton Bearing Factory succeeding Glenn. Fred Barnard, Assistant Canton Bearing Factory Metallurgist, has been appointed Canton Bearing Factory metallurgist succeeding Tobey. Joseph Selby, has been appointed Assistant Canton Bearing Factory Metallurgist succeeding Barnard. Russell P. Fowler, Assistant General Superintendent of the Columbus plant, has been appointed superintendent of the Bucyrus Bearing Factory, where operations are scheduled to begin early this spring.

New Distributor for Penn Drake

The L. D. Seely Co., South and Clinton Sts., Eatontown, N. J., has been appointed Penn Drake snow plow wax distributor in the state of New Jersey. Announcement of this appointment is made by S. A. Pearce, division sales manager for Pennsylvania Refining Co., Cleveland 4, Ohio.

Appointed Advertising Manager

C. S. Weber

Appointment of Charles S. Weber as advertising manager of The Thew Shovel Co., Lorain, O., has been announced by J. L. Beltz, Manager Sales Promotion. Mr. Weber, formerly production manager of The White Advertising Co., of Cleveland, brings 20 years of experience to the power crane and shovel manufacturer in a move designed to further strengthen the firm's already aggressive sales promotion activities. Beltz will continue to head the department.

Appointed Assistant Sales Manager

J. E. Heuser

John E. Heuser has been appointed assistant sales manager of Le Roi Co., Milwaukee, Wis. Mr. Heuser is a graduate engineer from the University of Wisconsin with over 9 years of sales experience, during the past 3 years handling much of the sales administration for both Le Roi engine and compressor products. He will take over many of the duties of Cecil W. Brown, who recently resigned as general sales manager.

New Le Tourneau Distributor

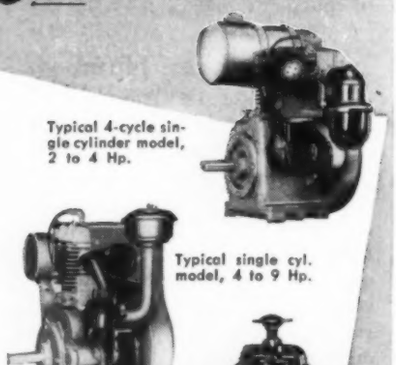
Kessler-Simon Machinery Co., 1545 Exchange Ave., Oklahoma City., Okla., has been appointed distributors for R. G. Le Tourneau, Inc., Peoria, Ill., for the entire state of Oklahoma.

Increase The PRODUCTIVE CAPACITY of Your Mechanized Equipment with WISCONSIN *Air-Cooled* ENGINES

If you build or use any kind of equipment that is or that CAN be successfully engine-powered — there is a fairly definite certainty that you can actually increase the productive capacity of the machine by motorizing with a Wisconsin Air-Cooled Engine.

This rather broad statement is predicated on the fact that Wisconsin Engines are notable for continuous, high ratio power output as well as an absolute minimum of maintenance and servicing layups. In addition to the basic advantages of air-cooling, light weight, compact design and all-weather serviceability—you are assured of "Most H.P. Hours" of on-the-job operation, thanks to advanced engineering and heavy-duty design and construction.

Wisconsin Engines are worth looking into on all counts. Your interest will be heartily reciprocated.



Typical 4-cycle single cylinder model, 2 to 4 Hp.

Typical single cyl. model, 4 to 9 Hp.

Typical V-type 4-cylinder model, 15 to 30 Hp.

MOST H.P. HOURS

WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 14, WISCONSIN

Miller Promoted by Goodyear

C. B. Miller

Charles B. Miller has been appointed district sales manager of Goodyear Tire & Rubber Co's Mechanical Goods Division at Chicago, Ill., The district embraces Illinois, Wisconsin and southern Indiana. He succeeds Guy E. McMahon, who will remain in Chicago as special representative for Goodyear industrial rubber products. Mr. Miller has been with Goodyear since 1937, and since 1945 has been Akron area field representative for the company's mechanical goods division. Mr. Miller is succeeded in Akron by William F. Burdick who has been with Goodyear since 1937.

To Handle Export Sales

William M. van der Kieft, Jr., George C. Strachan and Bernard G. Drummond have been appointed regional sales managers for the American Brake Shoe Co., in the Caribbean area, India, and South Africa respectively. Mr. van der Kieft will represent Brake Shoe in the Caribbean area with headquarters in New York City. Mr. Strachan will handle sales in Pakistan, Burma, Ceylon and India with headquarters in Bombay. Mr. Drummond will represent the company in North & South Rhodesia, Belgian Congo and the Union of South Africa with headquarters in Johannesburg.

Named Parts Merchandising Manager

R. K. Collick

Raymond K. Collick has been named parts merchandising manager of the Detroit Diesel Engine Division, General Motors Corporation. Mr. Collick came to Detroit Diesel from Chevrolet as an engineering draftsman in 1937. During the war he served as a technical analyst in connection with the division's extensive parts distribution program for the Navy. With the return to commercial business in 1945, Mr. Collick became assistant parts merchandising manager and held that position until his present promotion. In his new assignment he will report directly to John Ball, parts manager of Detroit Diesel.

Allied Steel Building Warehouse Addition

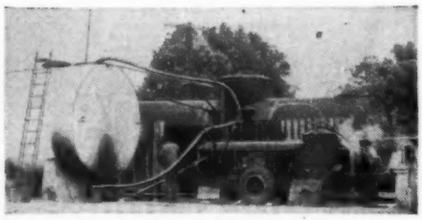
Ground has been broken for a $125,000 addition to the warehouse of the Allied Steel Products Inc., Cleveland, O. It will be one story, of brick and steel construction, to house the ever increasing business of the company. The company are specialists in the production of special steels for repair and maintenance of tractors and shovels.

New Le Roi Appointment

S. T. Brown

Sherman T. Brown has been appointed assistant foreign sales manager of Le Roi Co., Milwaukee, Wis. He comes to the Le Roi Co. with 20 years experience in domestic and export sales. Most recently he has served as assistant export manager with the Gardner-Denver Company at Quincy, Ill. Earlier he served as project engineer with the Douglas Aircraft Co. in California.

HOT ASPHALT . . . *QUICK!*



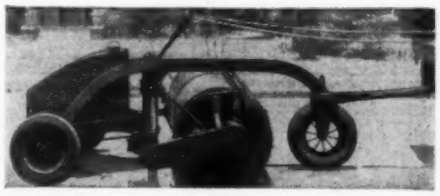
GRACE RAPID FIRE HEATER

For heating all types of asphaltic material in tank cars or truck tanks . . . Will thaw one car while circulating and loading out another car.

With the Rapid Fire Combination heater, two units on one chassis are on the job—designed for pumping heavy asphalt and road oils under ALL conditions.

GRACE 2-WAY AXLE-DRIVEN SWEEPER

Simple transmission and pivoting mechanism assures easy operation of this multi-service sweeper. Brush, featuring long life bristles and steel shaft to eliminate warping, may be changed to sweep right or left at angles up to 30° in a few seconds.



SEE OUR DISPLAY AT THE ARBA SHOW IN CHICAGO JULY 16-24 . . . BOOTH 3860

W. E. GRACE MFG. CO.

6005 South Lamar Street • Dallas, Texas

Plan Your ALL-DIESEL Operation NOW SEE WITTE Diesels Exhibited at the ROAD SHOW—CHICAGO!

3 KVA Radiator-Cooled WITTE Dieselectric Plant

You can keep gasoline entirely off your jobs once you have an all-Diesel operation. WITTE Dieselectric Plants start and operate on same non-explosive fuel as your Diesel tractors—require little space, care or fuel—*save up to 75% over gasoline power costs.* Provide daytime visibility on nighttime operations, power small motors, and electric hand-tools. Portability multiplies Dieselectric usefulness—they're easily mounted on skids.

There's a Size and Type to Meet Your Light and Power Needs

WITTE DIESELECTRIC PLANTS

Reg. in U. S. Pat. Off.

Dieselectric Plants range from 3 to 10 KVA-AC; 2.5 to 8 KW-DC. Each is a complete electric power plant in itself; two or more Dieselectric Plants can be paralleled for greater power-output if necessary. Tank, radiator and fan, or condenser cooling systems are available as required.

Have Dependable, Steady Electric Light and Power on Cheap Diesel Fuel Oil!

Built for continuous heavy duty, without requiring continuous attendance, your Dieselectric Plant will deliver the electric light and power you need, when you need it, at bottom cost. See these efficient, cost-cutting power-makers at the Chicago Road Show in July. Meantime, write for WITTE literature now.

WITTE ENGINE WORKS

DIVISION OF OIL WELL SUPPLY COMPANY — UNITED STATES STEEL CORPORATION SUBSIDIARY

AMERICA'S PIONEER BUILDER OF SMALL DIESELS — KANSAS CITY 3, MO. U.S.A.

Porter Promoted by Huber

G. N. Porter

G. N. Porter has been appointed to the newly created position of special representative of the sales department of The Huber Manufacturing Co., Marion, O. As special representative he will be in contact with the company's district managers and distributors throughout this country and Canada. Mr. Porter has been with Huber for 27 years. Immediately prior to accepting the new position, he was for five years manager of District 2, covering Huber sales in Ohio, Indiana, Michigan, Kentucky, and West Virginia. He will be succeeded as district manager by George A. Howser of Marion, World War II veteran who has had eight years' experience in industrial sales.

Appointed Assistant Division Manager

Robert A. Lawson has been appointed as assistant division manager of the Findlay Division of Gar Wood Industries, Inc., at Findlay, O. Prior to this appointment, Mr. Lawson was Superintendent of Gar Wood's Plant No. 4 in Highland Park, Mich. The Findlay Division manufactures the well known Buckeye ditchers, spreaders, finegraders, power shovels, and Gar Wood tractor equipment.

New Gumout Distributor

Pennsylvania Refining Co., Cleveland 4, Ohio announced appointment of The Tresler Oil Co., 4015 River Road, Cincinnati, O., as distributor for Penn Drake Gumout for Hamilton, Clermont and Brown Counties in Ohio.

VULCAN PAVEMENT AND CLAY DIGGING TOOLS

ARE MADE in a complete line of sizes to fit all standard compressed air hammers.

Send for NEW Vulcan illustrated CATALOG today.

TOOLS — THE WORLD OVER — NOTED FOR QUALITY AND DURABILITY

VULCAN TOOL MFG. CO.
QUINCY, MASS.

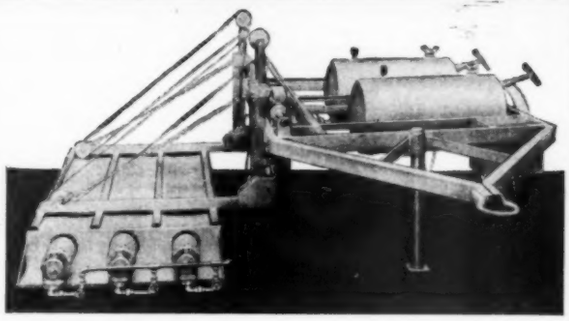
White
SURFACE HEATERS

Why destroy pavement base to apply new surface?

These heaters melt 1" of old asphalt in 5 minutes. New top can be placed without damaging base.

Sizes 6 x 6'; 3 x 6'

Write for Catalog.



ELKHART White Mfg. Co. INDIANA

Allis-Chalmers Appointments

Richard M. Stone has been appointed industrial sales manager of Allis-Chalmers Tractor Division, succeeding Wm. J. Faulkner, resigned. Mr. Stone joined Allis-Chalmers in 1928. He has been repair parts manager at the Fargo, N. Dak., branch and supervisor of repair parts for the

E. G. Kullmann

R. M. Stone

Tractor Division at Milwaukee. In 1935 he became industrial sales manager of the Peoria branch, and in later years served as Northwest territory manager. In 1943 he was appointed assistant manager of the Tractor Division's Export Department.

E. G. Kullmann has been appointed assistant general sales manager of Allis-Chalmers Tractor Division, and will undertake for the entire Tractor Division duties similar to those he has been handling as assistant industrial sales manager since 1939. He joined Allis-Chalmers in 1928.

Distributors for All-State Welding Alloys

Bert Laune, President, All-State Welding Alloys Co., Inc., 96 West Post Road, White Plains, N. Y., has announced the following distributors recently appointed for the All-State line of low-temperature welding and brazing alloys and fluxes: Pacific Welding Supply, 520 West Pacific Coast Highway, Long Beach, Calif., Hendrie & Bolthoff Co., 1635-17th St., Denver, Colo., Southern Oxygen Co., Inc., P. O. Box 5087, Washington,

Shunk
Superior Quality
BLADES
AND CUTTING EDGES

For any make of machine Motor Graders, Maintainers, Scrapers, Drags, Bulldozers, Backfillers, Wagon Scrapers, Trail Builders, Trail Blazers, Carryalls. Also—

CUTTING EDGES
WEARING BOOTS
BACK SLOPERS
EXTENSION BLADES
MOLDBOARDS
and
SCARIFIER TEETH

50 years of manufacturing blades has developed for you a special steel, milled through our own rolls and forged at the edges to give that extra wearing quality you need.

All widths lengths, and thicknesses, punched ready to fit your machine.

Consult your internationally recognized Blade Specialists. Write for special bulletins, giving type and name of machines you operate—get set for Blades early.

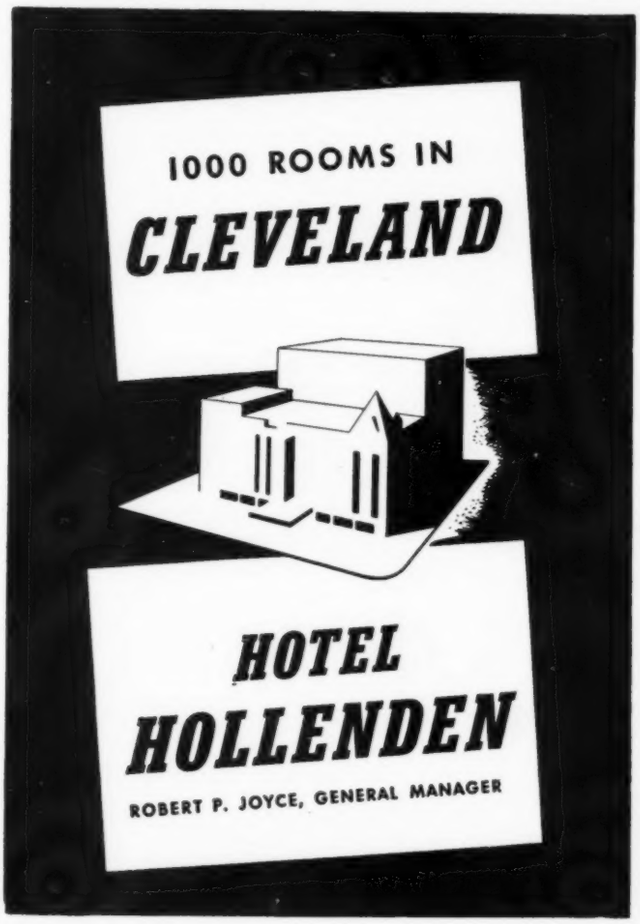
ALLIED EQUIPMENT DISTRIBUTORS ASSOCIATED MEMBER

Shunk
MANUFACTURING COMPANY
Established 1854
BUCYRUS, OHIO.

PORTABLE ASPHALT PLANTS
High Production—Low Cost

THE McCARTER IRON WORKS, INC.
NORRISTOWN, PENNA.

FOR A LEVEL RIDE
the La Crosse Oscillating Axle..
Here's the axle for loading problems, bumpy roads, uneven terrain.
*Full oscillation without strain on any part of the axle assembly.
*Full length axle, machine straightened, assures wheel alignment under all conditions of oscillation.
*Sufficient oscillation to permit one wheel to maneuver a 10" obstacle.
Dealers in all 48 States.
HEAVY DUTY
LA CROSSE
TRAILER CORPORATION
LA CROSSE, WISCONSIN



D. C., Meco Welding Supply Co., 4835 So. Western Blvd., Chicago, Ill., Owen Welding Supply Co., 9541 So. Damen Ave., Chicago, Ill., Mittler Supply Co., 105 W. Garst St., South Bend, Ind., Robinson Welding Supply Co., 8706 Lyndon Ave., Detroit, Mich., Layman Welding Supply Co., 1000 Ottawa Ave., N. W., Grand Rapids, Mich., Jackson Welding Supply Co., Inc., 136 Broad St., Rochester, N. Y., Arcway Equipment Co., 313 Sixth Ave., Pittsburgh, Pa., Commercial Gas Corp., 111 Scott St., Wilkes-Barre, Pa., Welders Supply, Inc., P. O. Box 5528, Dallas, Texas.

C F I Appointments

A. S. Rairden has been appointed wire rope sales manager for the Colorado Fuel and Iron Corporation, its subsidiaries and divisions. He joined the Wickwire Spencer Steel Division in October 1933 as wire rope sales engineer and became wire rope sales manager of Wickwire Spencer Steel Co. prior to its merger with The Colorado Fuel and Iron Corporation. E. L. Klingler has been appointed wire rope sales engineer for The Colorado Fuel and Iron Corporation. In his new capacity he will continue supervision of expanded sales engineering force in addition to acting as assistant to A. S. Rairden, wire rope sales manager of the corporation at Palmer, Mass.

A. S. Rairden

E. L. Klingler

DIG for IMPROVEMENTS ... EVERYWHERE

Long experience and intensified experimentation has enabled Owen engineers to originate designs, utilize special alloys and develop methods of manufacture that reduce weight, increase strength and provide greater wear resisting qualities.

"Owen Clamshell Buckets Insure a Bigger Day's Work."

The Owen Bucket Company
6070 Breakwater Avenue, Cleveland, Ohio
Branches: New York • Philadelphia • Chicago • Berkeley, Cal

5,000 Reasons

for coming to the Road Show

HERE at the Chicago Road Show you will see the biggest, most dramatic equipment demonstration in history . . . 30 acres of construction machinery . . . over 5000 machines of all types . . . many being shown for the first time . . . all of them greatly improved over pre-war models. These are the machines you will be using (or competing against) this year and next . . . this is your one big opportunity to pick the ones you need to increase your efficiency, reduce costs. Better come and look them over.

9 BIG DAYS OF VALUABLE CONTACTS

Friday, July 16	Distributors Day
Saturday, July 17	International Day
Sunday, July 18	Educators and ARBA Student Chapters Day
Monday, July 19	Associated General Contractors Day
Tuesday, July 20	ARBA Contractors Day
Wednesday, July 21 . . .	County Day
Thursday, July 22	Municipal and Airport Day
Friday, July 23	All States Day
Saturday, July 24	Chicago Day

Plus INSTRUCTIVE TECHNICAL SESSIONS ON:

- Highway engineering
- Grade separations
- Airport construction
- Express highways and terminals
- Soil compaction
- Contract system vs. day labor
- Tar soil stabilization
- Cement soil stabilization
- Highway safety
- Snow and ice control
- Weights and sizes of vehicles
- Financing and legal problems—and many other vital topics.

ARBA-4

45th ANNUAL CONVENTION and INTERNATIONAL ROAD SHOW . . .

SOLDIER FIELD, CHICAGO, JULY 16-24, 194

AMERICAN ROAD BUILDERS ASSOCIATION

International Building, Washington 4, D. C., U.S.A.

CLEARING HOUSE

OPPORTUNITIES

OPPORTUNITY

Will sell an interest in my heavy duty contracting outfit.

F. H. DeATLEY
222 Second Avenue, Lewiston, Idaho

EQUIPMENT WANTED

WANTED: Small Ditch Digger or Trencher. Must be in good usable condition. Prefer Parsons Trenchliner.

CITY OF LORDSBURG MUNICIPAL AIRPORT
P. O. Box EE, Lordsburg, New Mexico

FOR SALE

DEPENDABLE USED MACHINES

Link Belt Model 55 crane Osgood Model 200 backhoe Byers ¾ yd. dragline Badger port. gravel plant B-G Model 522 loader Morris 10 in. sand pump.

TRACTOR & EQUIPMENT CO.
3521 W. 51st St. Chicago, 32

175 Like New Delco Remy Bone Dry #25A1, 6 Volt, 75 Plate, 200 Amp., Heavy Duty Batteries.

HALL & RIVERS
P. O. Box 188 Coal Hill, Ark.

FOR SALE

One (1) 1924 American LaFrance 75' Ladder Truck with a varied assortment of ladders. Address inquiries to:

John H. Corcoran, Purchasing Agent, City Hall, Cambridge, Massachusetts.

WANTED

TRUCK CRANE:

Pneumatic or Caterpillar type; 10 to 20 ton, with about 20 or 30 Ft. Boom.

INTERSTATE MACHINERY CO., INC.
1431 W. Pershing Rd., Chicago 9, Ill.
Phone: Yards 5800

FOR SALE

3 Ton C.H.& E. Tandem Roller
2—10,000 Gal. Asphalt Tanks
1 Ton Portable Asphalt Plant

DARIEN CORP.
60 E. 42nd St., N.Y. 17, N.Y.

FOR SALE

New Heltzel 1¼ Cu. Yd. Universal Model Batcher—Dial Scale—Original Crating. 18' Hy. Duty Float Trailer—Excellent Condition. Portable Car Unloader and Elevator, Baughman.

EGYPTIAN CONCRETE CO.,
BOX 8, SALEM, ILL.

FOR SALE

New 100 H. P.

FORD MERCURY POWER UNITS

Complete with self starter, generator, distributor, governor, oil-bath air cleaner, battery, special large cast iron shell radiator, oversize 19-inch diameter fan, all enclosed in a sheet metal house.

Price each $535.00

Twin Disc power take-off clutch.....each $55.00
These are new units on which we are overstocked.

GEHL BROS. MFG. CO.
DEPT. 68 WEST BEND, WIS.

Seaman Rotary Tiller & Road Mixer, 6 ft., Waukesha Engine 68 H.P. Perfect condition $1,200.00

IOWA Portable Crushing & Screening Plant. 2 Units. 20" x 36" RB. Jaw crusher; 18" x 30" Double Rolls; Feeder; 30" Conveyors. V-belt to two Climax gasoline power units. 3' x 8' 2-deck Vibr. screen. Complete with $1,000.00 new spares, like jaws, bearings, belting, etc. Would rent. Orig. price $32,500.00. Price $22,000.00

Standard Steel Tar Kettle, 80 gallon, with motor, pump, burner, rubber tired. A-1. $285.00

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- 4 Portable Plants
- 5 Screens

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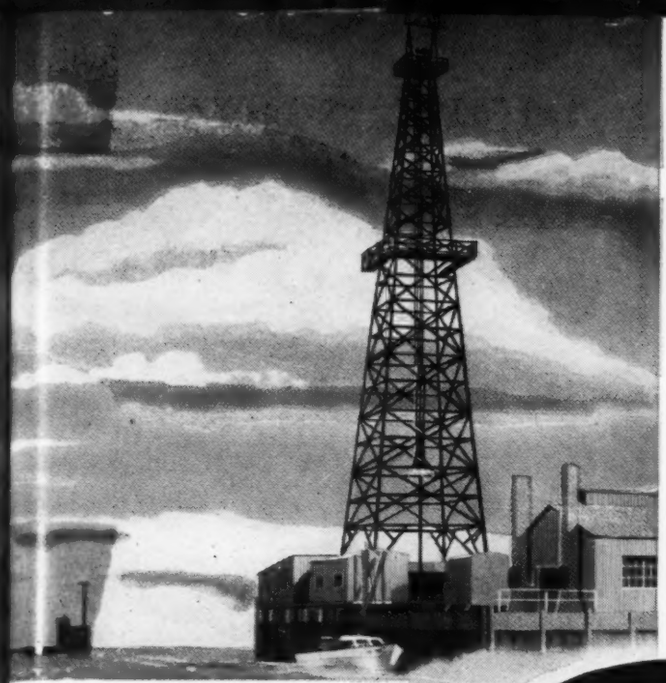

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